

**Highway Safety Improvement Program**

# **Benefit-Cost Tool DRAFT Users Manual**

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**Illinois Department of Transportation**

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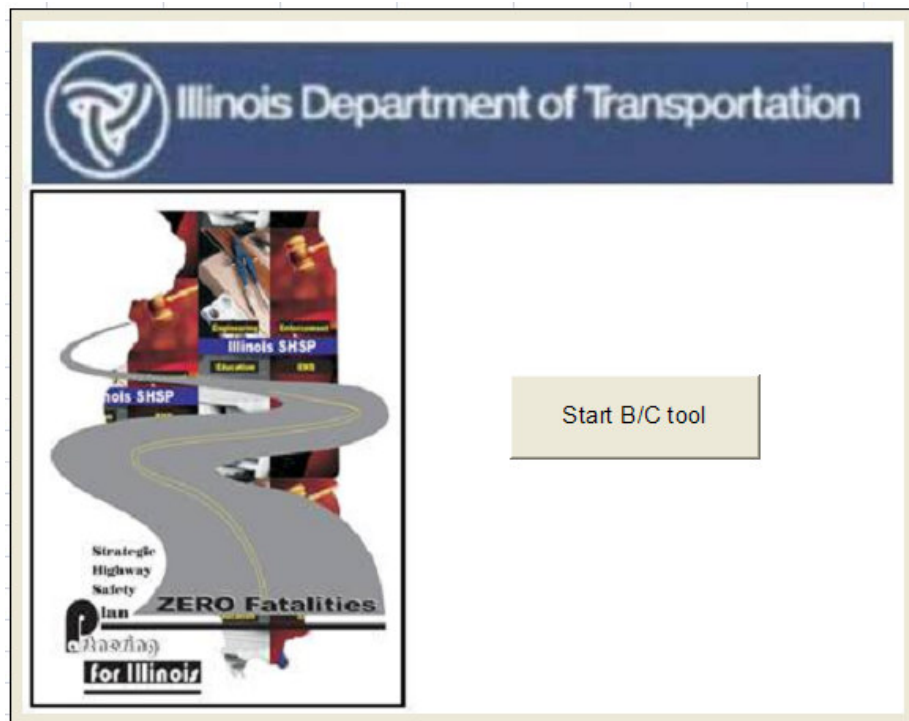


## 1.0 Introduction

Benefit-cost analysis (BCA) is one of the tools used to determine if a project is appropriate for receipt of Highway Safety Improvement (HSIP) funding support. An approved project should have a safety focus and result in an improvement which will likely reduce the number of fatal and/or severe injury crashes. To facilitate the process, the Illinois Department of Transportation developed a BCA tool to aid in quick and accurate evaluation of highway improvement proposals.

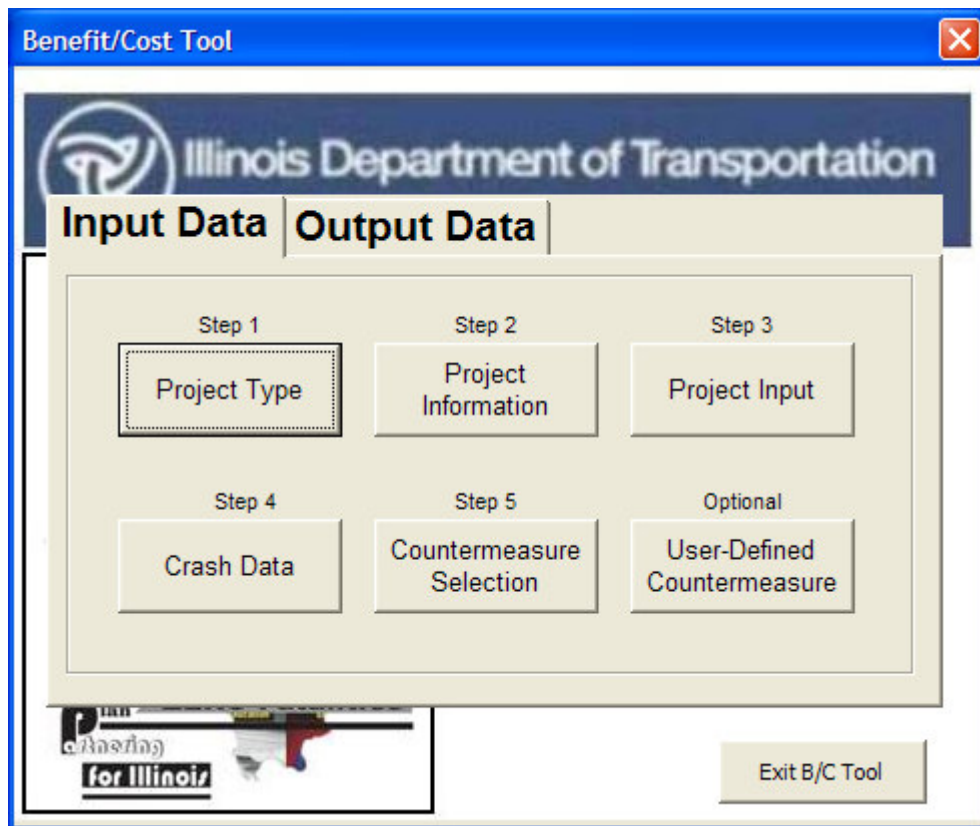
This manual provides step-by-step instructions for using the BCA tool developed by IDOT. It also provides several example scenarios to assist the user in understanding use of the tool in project development. The final section of this document provides guidelines for appropriate benefit-cost values.

## 2.0 Step-by-Step Instructions



The image above shows the opening page of the B/C tool.

STEP 1: Start by pressing the **Start B/C Tool** button.



The main menu will open after selecting start. The main menu has two tabs located at the top of the screen. One is for entering Input Data and the other for obtaining Output Data.

STEP 2: Select the **Input Data** tab if necessary. This is the default and should have been open when starting the tool.

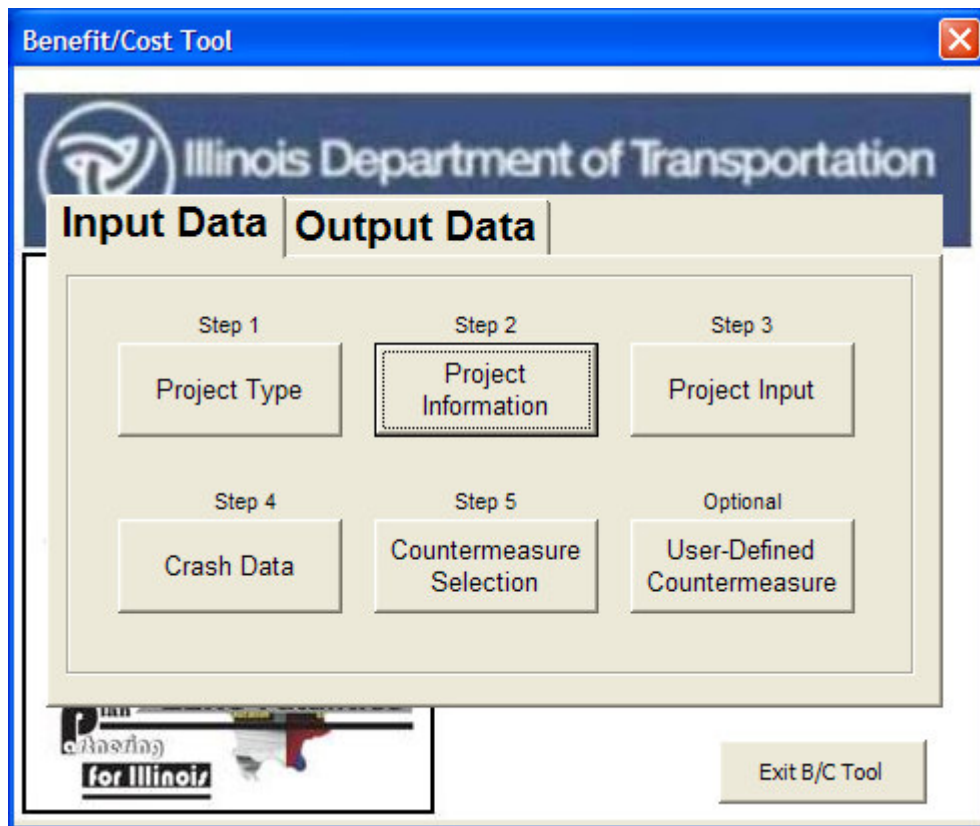
The input tab shows a series of steps. It is recommended that you follow the sequence of input steps as shown in the pop-up window; however you can come back to buttons to revise the data as needed.

STEP 3: Select the button labeled **Project Type**

The image displays two side-by-side screenshots of the 'Project Type Selection' window. Both windows have a title bar with a close button (X). The left window is for 'Intersections' and the right is for 'Segments'. Both have 'State' selected under 'Road System' and 'Intersection' or 'Segment' selected under 'Project Type'. The left window lists eight 'Intersections Peer Groups' (PG1-PG8), with PG2 selected. The right window lists twelve 'Segments Peer Groups' (PG1-PG12), with PG2 selected. Both windows have a 'Return to Main' button at the bottom.

The Project Type Selection window will appear.

STEP 4: Select project type by clicking on the circle next to State or Local. The State Road System is intended for all IDOT maintained facilities while the Local Road System can be used for city/town collector and arterial facilities. Note – in the current version of the tool, local cannot be selected. For both road systems, the **Intersection** or **Segment** will be activated after the Road System selection. After selecting the appropriate project type, the eight IDOT intersection or twelve IDOT segment **Peer Groups** will be activated. Make the selection by clicking on the circle next to the appropriate category. When complete click on the **Return to Main** button to return to the main input window.

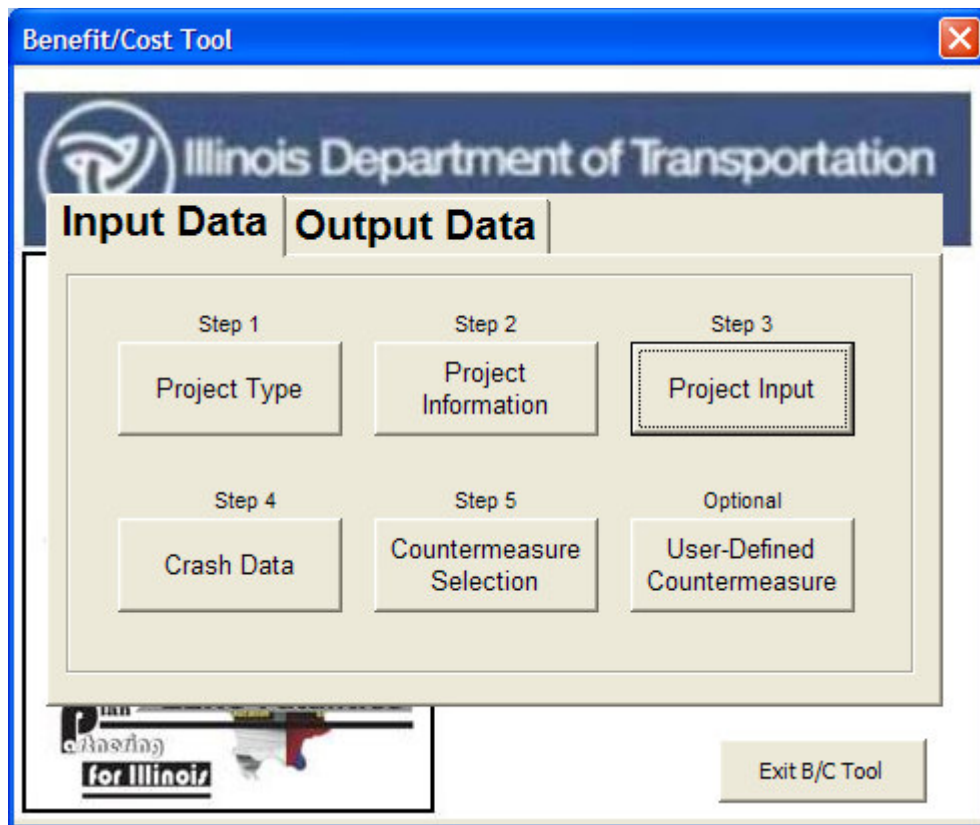


STEP 5: On the main menu, select the button labeled **Project Information**.

The Project Information window will open as shown above.

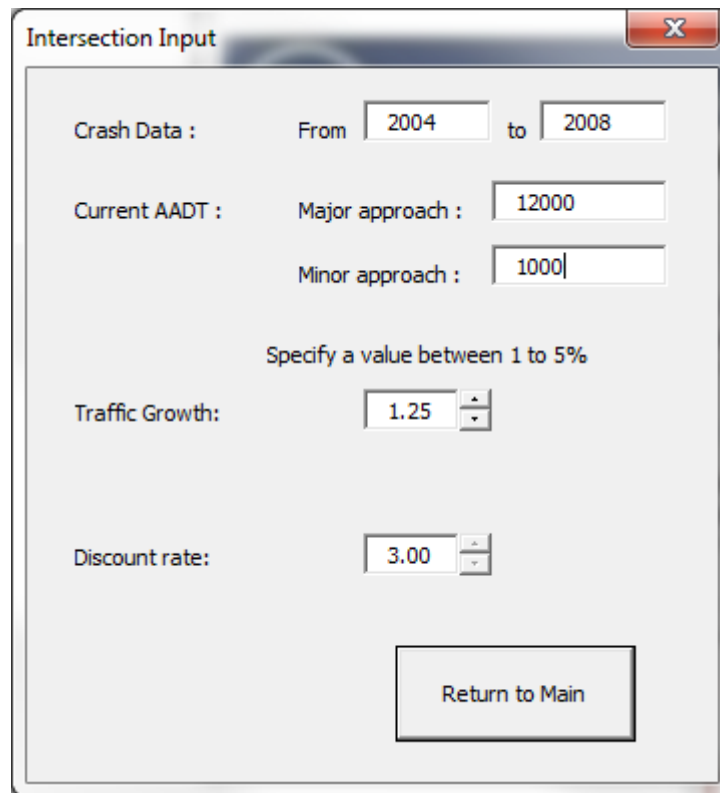


STEP 6: Complete the information in the boxes shown. For segments enter either key route or marked route and the beginning milepost station. Key Route refers to the Illinois Roadway Information System (IRIS) terminology and it is a universal identifier for any segment. Marked Route refers to the Division of Traffic Safety route inventory. The key route information is not necessary for intersections, but all information provided will assist in tracking projects. For the **Location** field enter a description like “Maple Road and Oak Street” for an intersection or “Maple Road between Oak Street and Walnut Street” for a segment. When all fields have been completed, click on **Return to Main**.



The main menu will re-open.

STEP 7: Select the button labeled **Project Input**.

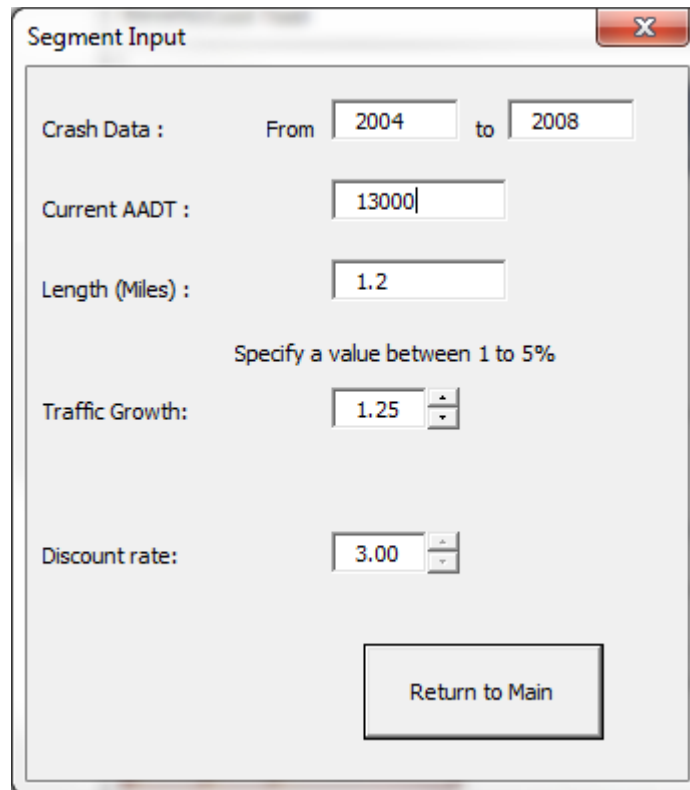


The 'Intersection Input' dialog box contains the following fields and controls:

- Crash Data :** From  to
- Current AADT :**
  - Major approach :
  - Minor approach :
- Traffic Growth:**  (with up/down arrows)
- Discount rate:**  (with up/down arrows)
- A button labeled **Return to Main** at the bottom.

Text below the Traffic Growth field: Specify a value between 1 to 5%

If intersection project type was selected, the project input window shown above will appear.



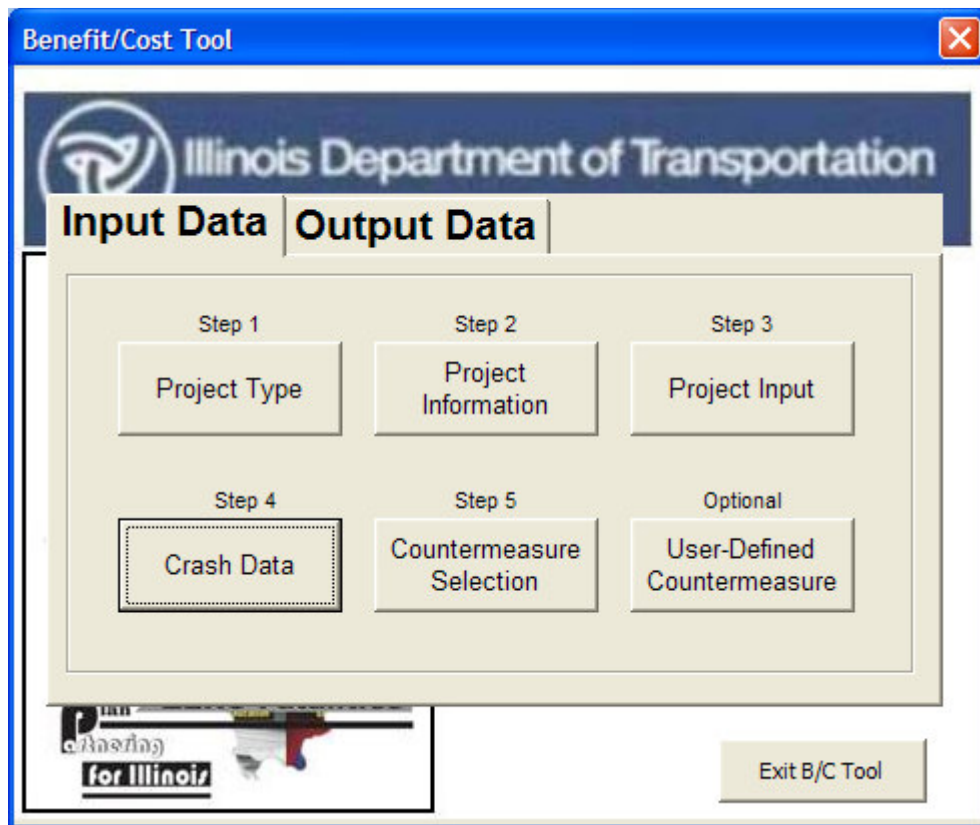
The 'Segment Input' dialog box contains the following fields and controls:

- Crash Data :** From  to
- Current AADT :**
- Length (Miles) :**
- Traffic Growth:**  (with up/down arrows)
- Discount rate:**  (with up/down arrows)
- A button labeled **Return to Main** at the bottom.

Text below the Length (Miles) field: Specify a value between 1 to 5%

If segment project type was selected, the above project input window will appear.

STEP 8: Input the information requested in the fields of either the **Intersection Input** or **Segment Input** window. For **Crash Data**, enter the period for which crash data is available (for example, 2004 to 2008). Enter the **Current AADT** (Average Annual Daily Traffic), length of project if applicable, and the annual traffic growth. The annual **traffic growth** should be a number between 1 and 5. If no selection is made, the default value of 1.25 will be shown. If the user enters a value less than one, it is assumed that the traffic growth is declining. The **discount rate** cannot be modified from the default value of 3.00. When complete with all fields click on **Return to Main**.



The main menu will re-open.

STEP 9: Select the button labeled **Crash Data**.

Crash Data

Crash Data Availability

What type of crash data do you have available? :

☒ Crash Severity Distribution by Crash type

☐ Aggregate Crash Severity Distribution

Crash Data - Condition Related

Do you have night time crashes and will analyze a night time countermeasure? : ☐ Yes

Do you have wet pavement crashes and will analyze a wet pavement countermeasure? : ☐ Yes

Enter Crash Data

Return to Main

The above window will open.

STEP 10: If crash type and crash severity data are available, select **Crash Severity Distribution by Crash Type** by clicking on the circle next to the text. If crash type data are not available, select the **Aggregate Crash Severity Distribution** category by clicking on the circle next to the text. In most cases crash type data will be available. This is the preferred condition since countermeasures are applied to reduce particular crash types.

If **Crash Severity Distribution by Crash Type** is selected, follow STEPs 11A to 13A. If **Aggregate Crash Severity Distribution** is selected, skip to STEP 11B and follow to STEP 12B.

The screenshot shows a software window titled "Crash Data" with a standard Windows-style title bar (minimize, maximize, close buttons). The window contains two main sections. The first section, "Crash Data Availability", asks "What type of crash data do you have available? :". It has two radio button options: "Crash Severity Distribution by Crash type" (which is selected and highlighted with a dashed border) and "Aggregate Crash Severity Distribution". The second section, "Crash Data - Condition Related", contains two questions, each with a "Yes" checkbox. The first question is "Do you have night time crashes and will analyze a night time countermeasure? :". The second question is "Do you have wet pavement crashes and will analyze a wet pavement countermeasure? :". At the bottom of the window is a large button labeled "Enter Crash Data".

When **Crash Severity Distribution by Crash Type** is selected **Crash Data - Condition Related** will highlight as shown in the above window.

STEP 11A: If there are night time crashes in your data set, click on the **Yes** box following the question, **Do you have night time crashes and will analyze a night time countermeasure?** If there are wet pavement crashes in your data set, click on the **Yes** box following the question, **Do you have wet pavement crashes and will analyze a wet pavement countermeasure?** If there are night time and/or wet pavement crashes present in the study area; however, a night time or wet pavement countermeasure (such as deslicking) is not proposed, the data input for these crash types is optional.

See page 21 to learn more about obtaining crash information from the crash reports.

After selecting “Enter Crash Data,” up to three input boxes will appear, depending if wet pavement and night time crash types were selected. In the top input box, **Intersection Crash Severity Distribution by Crash Type for Analysis Period- All Crashes**, enter all crashes during the analysis period, regardless if they occurred at night, or during wet pavement conditions. Under the All Crashes input box, a separate input box for night time and wet pavement crashes will be shown if either of these options were selected under the crash data window. Fill in only the applicable crashes (specific to night time or wet pavement conditions) under these two input boxes.

**INTERSECTION CRASH SEVERITY DISTRIBUTION BY CRASH TYPE FOR ANALYSIS PERIOD - ALL CRASHES**

	Angle	Animal	Fixed Object	Head On	Left Turn	Other Noncollision	Other Object	Overtaken	Pedestrian	Pedalcyclist	Parked Vehicle	Rear End	Right Turn	Sideswipe Same Direction	Sideswipe Opposite Direction	Turning	Train
	AG	AN	FO	HO	LT	OtherNC	OtherO	OVT	PD	PDC	PKV	RE	RT	SSD	SOD	T	TR
Fatal Crashes	1											1			1		1
A-Injury Crashes		1										1			1		1
B-Injury Crashes				1			1			1						1	
C-Injury Crashes																	
PDO Crashes																	

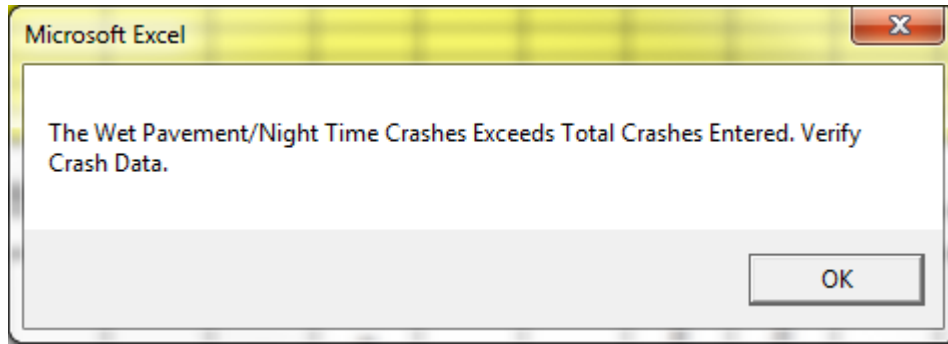
**INTERSECTION CRASH SEVERITY DISTRIBUTION BY CRASH TYPE FOR ANALYSIS PERIOD - NIGHTTIME**

	Angle	Animal	Fixed Object	Head On	Left Turn	Other Noncollision	Other Object	Overtaken	Pedestrian	Pedalcyclist	Parked Vehicle	Rear End	Right Turn	Sideswipe Same Direction	Sideswipe Opposite Direction	Turning	Train
	AG	AN	FO	HO	LT	OtherNC	OtherO	OVT	PD	PDC	PKV	RE	RT	SSD	SOD	T	TR
Fatal Crashes																	
A-Injury Crashes																	
B-Injury Crashes																	
C-Injury Crashes																	
PDO Crashes																	

At the bottom of the worksheet, a grayed out matrix shows the difference between all crashes and the wet pavement/night time crashes. If a value is less than zero in this matrix, a warning box will pop up, and will not allow the user to continue until the input error has been corrected.

**INTERSECTION CRASH SEVERITY DISTRIBUTION BY CRASH TYPE FOR ANALYSIS PERIOD - ALL NON WP/NGT CRASHES**

	Angle	Animal	Fixed Object	Head On	Left Turn	Other Noncollision	Other Object	Overtaken	Pedestrian	Pedalcyclist	Parked Vehicle	Rear End	Right Turn	Sideswipe Same Direction	Sideswipe Opposite Direction	Turning	Train
	AG	AN	FO	HO	LT	OtherNC	OtherO	OVT	PD	PDC	PKV	RE	RT	SSD	SOD	T	TR
Fatal Crashes	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
A-Injury Crashes	0	1	0	0	0	0	0	0	0	0	0	1	0	0	1	0	1
B-Injury Crashes	0	0	0	1	0	0	1	0	0	1	0	0	0	0	0	0	0
C-Injury Crashes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
PDO Crashes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0



STEP 13A: Enter the crash data for the analysis period by crash type and severity. Individual crashes should only be entered once based on the first event of the crash. When complete, select the **Return to Main** button and continue with STEP 14. Be sure to “enter” the last data entered by using the **Enter** key or clicking another cell before attempting to click the **Return to Main** button.

**Crash Data**

Crash Data Availability

What type of crash data do you have available? :

☐ Crash Severity Distribution by Crash type

☒ **Aggregate Crash Severity Distribution**

Crash Data - Condition Related

Do you have night time crashes and will analyze a night time countermeasure? : ☐ Yes

Do you have wet pavement crashes and will analyze a wet pavement countermeasure? : ☐ Yes

**Enter Crash Data**

STEP 11B: If crash type by severity is not available, click on the circle next to **Aggregate Crash Severity Distribution** in the Crash Data screen. Then click on **Enter Crash Data** to enter aggregate crashes by severity. It is important to notice that the user will not be able to input night time or wet pavement crashes with an aggregate crash severity distribution. Furthermore, the number of selectable countermeasures will be reduced. If **Aggregate Crash Severity Distribution** is selected, the **Crash Data - Condition Related** frame will not become available as is shown in the figure above.



	A	B	C	D
1	<b>INTERSECTION AGGREGATE CRASH SEVERITY DISTRIBUTION</b>			
2				
3		All Crashes		
4	<i>Crash Severity</i>	<i>ALL</i>		
5	Fatal Crashes			
6	A-Injury Crashes			
7	B-Injury Crashes			
8	C-Injury Crashes			
9	PDO Crashes			
10				
11				
12	Return to Main			
13				
14				
15				

After selecting **Enter Crash Data** the input box shown above will appear. The box shown is for intersections, but a similar table will appear for segments.

STEP 12B: Enter the number of crashes by severity that have occurred during the analysis period. When complete, select the **Return to Main** button. Be sure to “enter” the last data entered by using the Enter key or clicking another cell before attempting to click the Return to Main button.

Benefit/Cost Tool
✕

Illinois Department of Transportation

**Input Data**
**Output Data**

Step 1

Project Type

Step 2

Project Information

Step 3

Project Input

Step 4

Crash Data

Step 5

Countermeasure Selection

Optional

User-Defined Countermeasure

Exit B/C Tool

The main menu will re-open.

STEP 14: Select the button labeled **Countermeasure Selection**.

INTERSECTION BENEFIT COST ANALYSIS									
BENEFIT CALCULATIONS					COUNTERMEASURE COST CALCULATIONS				
COUNTERMEASURE	CRF *	Crash Type affected by this improvement	Unit Cost	Quantity	Units	Total Cost	Service Life		
	0%	0			0	\$0	0		
	0%	0			0	\$0	0		
	0%	0			0	\$0	0		
	0%	0			0	\$0	0		
	0%	0			0	\$0	0		
	0%	0			0	\$0	0		

\*\*\*NOTE: IF THE NUMBER OF LEGS AFFECTED VARIES BY COUNTERMEASURES SELECTED, THEN CALCULATE THE BENEFIT-COST RATIO FOR EACH COUNTERMEASURE SEPARATELY (Use separate spreadsheets for each countermeasure applied).

\* CRF = Crash Reduction Factor  
 \*\* EUAC = Estimated Uniform Annual Cost

Return to Main

If intersection project type was selected, the countermeasure table shown above will appear. If segment project type was selected, a similar countermeasure table will appear.

STEP 15: Review the list of countermeasures shown in the drop down boxes. Appendix A provides additional information regarding the countermeasures included in the tool and their applicability. A list of all countermeasures is also provided in Table A4. Select countermeasures that affect the predominant crash types in the data set for the intersection or segment to be analyzed. Many countermeasures are only applicable to certain IDOT Peer Groups. It is also recommended that you review additional resources such as the latest edition of the Highway Safety Manual (AASHTO) and the FHWA Crash Modification Factors Clearinghouse (<http://www.cmfclearinghouse.org/>) for additional countermeasures and current crash modification factors (CMF). Appendix A provides additional information regarding countermeasure selection.

A CMF is a multiplicative factor used to compute the expected number crashes after implementing a given countermeasure at a specific site. For example, centerline rumble strips have a CMF of 0.79 for head on and sideswipe opposite direction crashes. If 10 head on and sideswipe opposite direction crashes were recorded, 7.9 crashes would be expected if the centerline rumble strips were implemented.

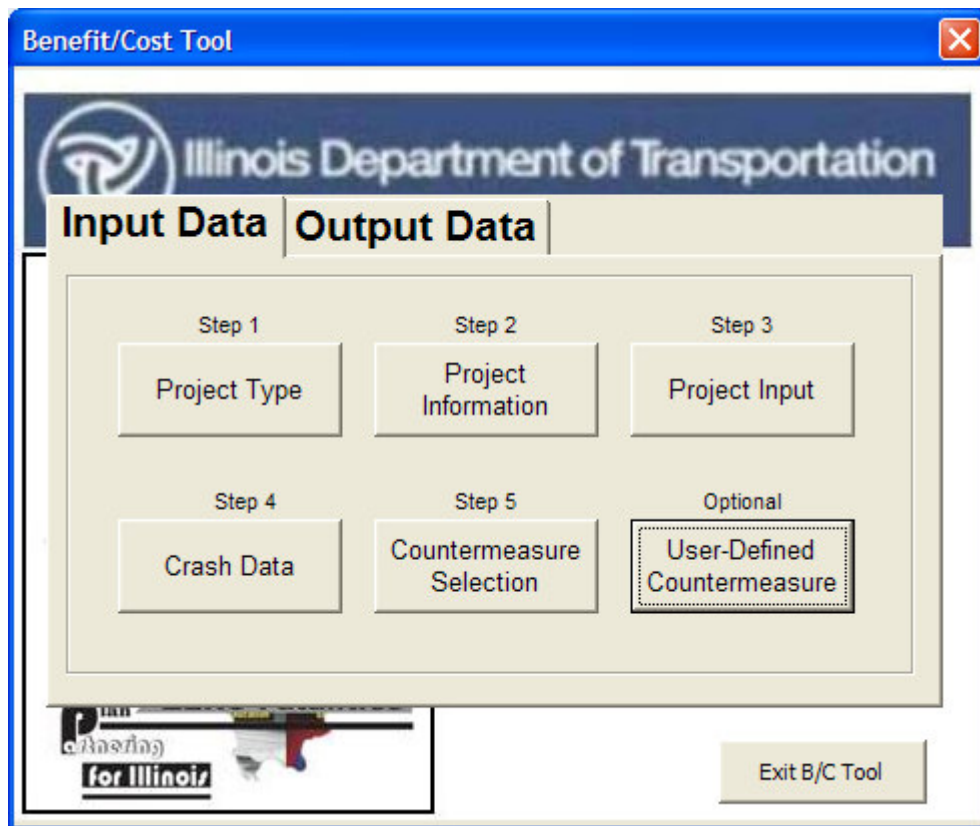
SEGMENTS BENEFIT COST ANALYSIS							
BENEFIT CALCULATIONS			COUNTERMEASURE COST CALCULATIONS				
COUNTERMEASURE	CMF*	Crash Type affected by this improvement	Unit Cost	Quantity	Units	Total Cost	Service Life
2.1.9.S1.1 Rumble Strips (Centerline) ▼	0.79	HO, SOD			Miles	\$0	8
▼		All				\$0	
▼		All				\$0	
▼		All				\$0	
▼		All				\$0	

\* CMF= Crash Modification Factor  
 \*\* EUAC = Estimated Uniform Annual Cost

Return to Main

STEP 16: Select the appropriate countermeasures using the pull-down menu under the countermeasure tab. The tool allows for selection and analysis of up to four countermeasures for one project. After selecting the countermeasure, the CMF, crash type affected, service life and countermeasure units will automatically populate. Note that if only aggregate crash data are provided, the tool will only calculate a benefit for countermeasures that affect All Crash Types.

STEP 17: Enter the **Unit Cost** and **Quantity** for each countermeasure. For example, enter \$10,000 and 1 if you are adding signing of this cost at one intersection. When complete, select **Return to Main**. Be sure to “enter” the last data entered by using the Enter key or clicking another cell before attempting to click the Return to Main button.



If you wish to add a countermeasure or use a countermeasure that is not listed, click on the Optional **User-Defined Countermeasure** button as shown in the above image.

1	COUNTERMEASURES LIST: CRASH REDUCTION FACTORS, COS									
2										
3										
4										
5	COUNTERMEASURES	Cost	Unit	Service Life	CRF	Crash Type Affected by Countermeasures	FE	RT	SSD	SDO
6	Non-Intersection (Segment) Locations									
7	Rumble Strips (Shoulder)		Miles	3	30%	FO,OVT				
8	General Pavement Marking		Miles	1	30%	All				
9	Curb Parking Removal		Unit Qty	20	50%	PKV,PE	50%			
10										
11										
12	User defined 01									
13	User defined 02									
14	User defined 03									
15										
16										
17										
27										
28	Note: If you have different CRFs for one countermeasure (See Example: cell F9), it is strongly suggested to input the CRFs under the proper crash type manually.									
29										
30										
31										
32	Place new CRFs									
33										
34										
35										
36	Return to Main									
37										
38										
39										

After selecting “User-Defined Countermeasure” the input box shown above will appear. The box shown is for segments, but a similar table will appear for intersections.

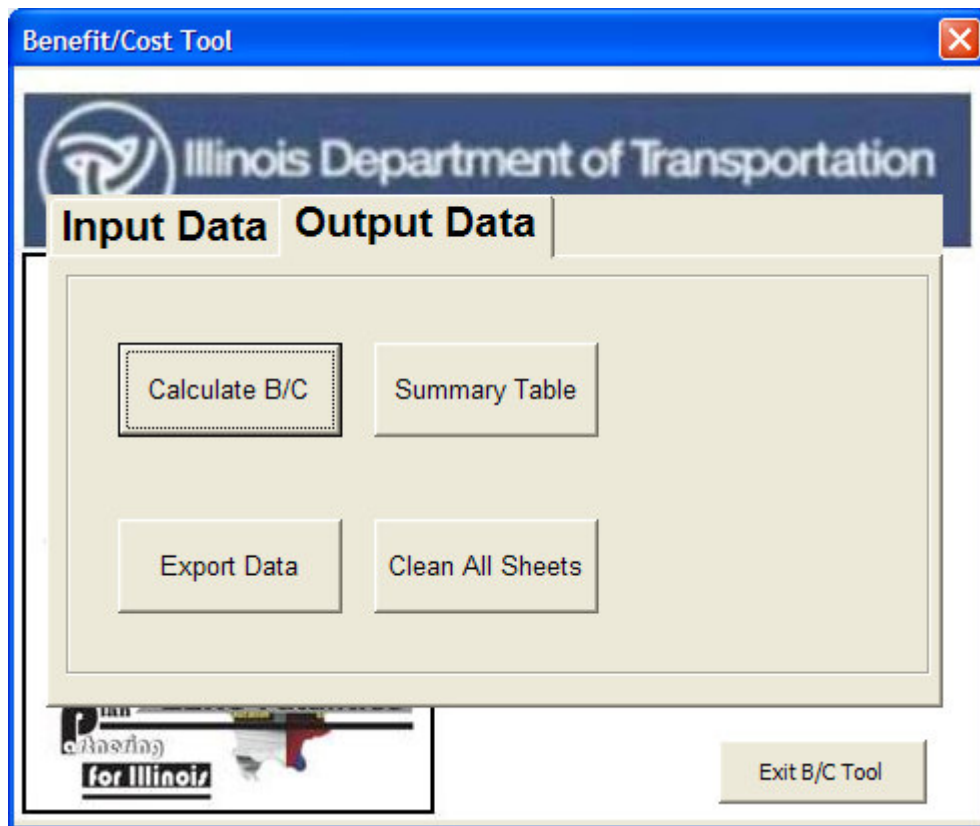
STEP 18: Enter the user-defined countermeasure description in the first box under countermeasures, shown in yellow. This box currently contains the text “User defined 01”. Enter the unit of measurement, service life, CMF, and crash type affected to the right of the

countermeasure description. Refer to the various CMF resources discussed above to obtain CMF values. Crash Type Affected should be entered by using the abbreviations shown in the table below, separated by commas without spaces. Examples are shown in the window above the input data.

<b>Legend</b>	
<i>All</i>	All Crashes
<i>AG</i>	Angle
<i>AN</i>	Animal
<i>FO</i>	Fixed Object
<i>HO</i>	Head On
<i>LT</i>	Left Turn
<i>OtherNC</i>	Other Noncollision
<i>OtherO</i>	Other Object
<i>OVT</i>	Overturned
<i>PD</i>	Pedestrian
<i>PDC</i>	Pedalcyclist
<i>PKV</i>	Parked Vehicle
<i>RE</i>	Rear End
<i>RT</i>	Right Turn
<i>SSD</i>	Sideswipe Same Direction
<i>SOD</i>	Sideswipe Opposite Direction
<i>T</i>	Turning
<i>TR</i>	Train
<i>NGT</i>	Night Time crash
<i>WP</i>	Wet Pavement

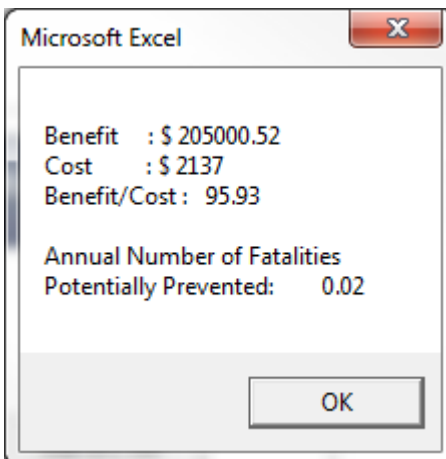
STEP 19: After completing the user defined countermeasure information, select the “Place New CMFs” button. This will populate the CMFs to the appropriate crash types in the columns to the right of the input data. A total of four user defined countermeasures can be added.

When complete select **Return to Main**.



When all input data has been completed, select the **Output Data** tab on the main menu and the screen shown above will appear.

STEP 20: Click on the **Calculate B/C** button to obtain the benefit-cost ratio.



The image above will appear with the benefit /cost ratio and the annual number of fatalities potentially prevented for the given countermeasures.



### 3.0 Special Cases - Partial Application of Countermeasures

One may wish to consider applying a safety-based countermeasure to part but not all of a segment or intersection. For example, left turn lanes may be contemplated for one roadway but not the crossing facility at an intersection. Should this be the case, the analyst must take care to properly estimate expected benefits and calculate an appropriate B/C ratio.

Proper use of the tool for such cases requires the analyst perform the benefit calculation taking into account the specific countermeasure application. This means calculating benefits separately for each approach or segment, applying only those countermeasures that apply to that approach, and applying them only to the crashes associated with that approach or segment. The following procedure is suggested:

STEP ONE: Determine which countermeasures apply to each intersection approach or segment

STEP TWO: Identify or designate which crashes are associated with each segment (best practices would be to refer to a crash diagram), inputting only those crashes into the worksheet that apply to that segment

STEP THREE: Perform the procedure as outline in this manual, calculating total benefits and costs for each unique segment and approach. Take care to label the input as 'approach A' or 'segment B', etc.

STEP FOUR: Sum all benefits and all costs from each approach calculation, and calculate a single overall project B/C.

This procedure can apply where multiple countermeasures are being studied. For example, one countermeasure may apply to the entire segment but the second to only part or parts of the study area. Use the tool to compute benefits for each unique segment, identifying the proper countermeasures for each one.

Care should be taken in designating crashes to not 'double count' or apply any one crash or crash type to multiple segments. Similarly, costs by segment should be carefully assigned to avoid double counting.

Note that the tool output will provide a B/C ratio for each approach. This *should not be used* (i.e., it is not correct to 'average' the segment B/C ratios); rather the costs and benefits provided in the output should be summed together and used to compute *one overall B/C ratio*.



## 4.0 Reading a Crash Report for Benefit-Cost Input Tool

Key input factors for the countermeasure tool are crash type, crash severity, weather condition and time of day. This example indicates the area of a crash report where this information can be obtained.

Crash type – This is coded as an Event in the lower left hand corner of the report. The event coded Unit 1 and Event 1 is usually the cause of the crash. In this example the crash type is “1”. Using template 1, indicates a non-collision, run off the roadway event. The event in row 3 shows a “2”. Again using template 1, this indicates that after running off of the road the vehicle is overturned.

Crash severity – Injury type is coded in the middle of the crash report to the right of the description of Unit 1. In this example the injury was “K” or fatal. “A” is an incapacitating injury, “B” is a noncapacitating injury, “C” is reported, but not evident, and “0” is no indication of injury. If there are multiple vehicles involved in the crash use the most severe injury type to describe the crash severity.

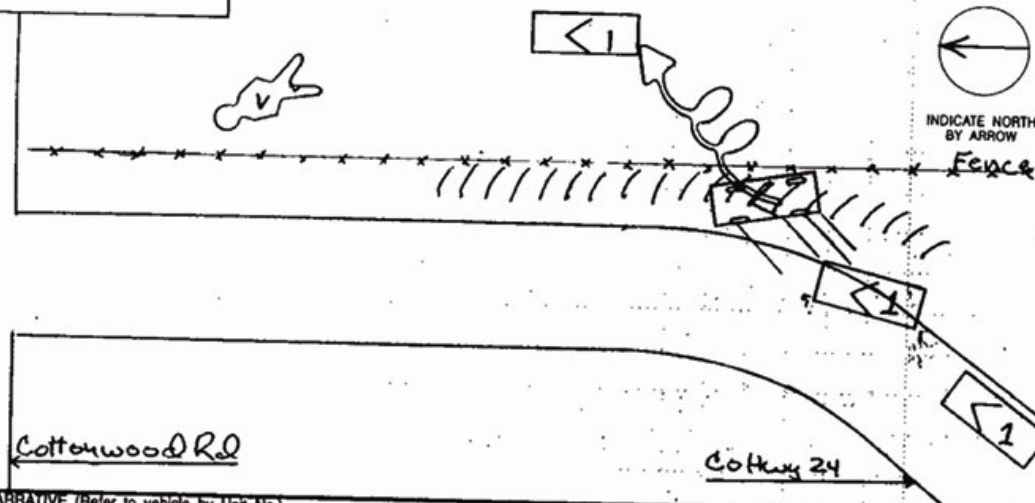
Weather condition – To determine if the pavement was wet during this crash refer to the column on the right of the report. The sixth entry from the top is labeled “RSUR” and reflects the roadway surface condition. In this example a “1” refers to dry pavement.

Night time crashes – To determine if this crash occurred at night, refer to the top line sixth box from the left labeled “LGHT”. This refers to the lighting condition. For this example “4” indicates “darkness”. Therefore, night time crashes should be selected.

Sheet of Sheets												
DRAC	REV	TRFD	TRPG	WEAT	DRNA	VS	VEHD	LGHT	COLL	WAVY	PPA	PPL
U1	U2	U1	U2	U1	U2	U1	U2	U1	U2	U1	U2	U1
7	X	X	1	1	4	X	1	X	4	6	15	X
INVESTIGATED BY <b>Fulton Co Sheriff POLICE</b>												
ADDRESS NO (OPTIONAL)												
HIGHWAY or STREET NAME <b>NO Co Hwy 24</b>												
CITY/TOWNSHIP (CIRCLE) <b>Farmington</b>												
COUNTY <b>Fulton</b>												
INTERSECTION RELATED <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No												
PRIVATE PROPERTY <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No												
HIT & RUN <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No												
DATE OF CRASH <b>09/27/01</b>												
TIME <b>1:30</b>												
LARS CODE												
LARS CODE												
ANY SINGLE VEHICLE/PROPERTY DAMAGED OVER \$500 <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No												
NO MOTOR VEHICLES INVOLVED <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No												
NAME (LAST, FIRST, M.I.) <b>309 647 1260 5322 7307 9037 II D</b>												
DATE OF BIRTH <b>02/06/79</b>												
SEX <b>M</b>												
SAFT <b>2</b>												
AIR <b>2</b>												
EJECT <b>K</b>												
CLASS <b>2</b>												
TAKEN TO <b>Proctor</b>												
EMS AGENCY <b>Fulton</b>												
MAKE <b>Jeep</b>												
MODEL <b>Grand Cherokee</b>												
YEAR <b>2000</b>												
STATE <b>IL</b>												
CIRCLE NUMBER(S) FOR DAMAGED AREA(S) <b>11</b>												
TOWED DUE TO DAMAGE <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No												
OTHER <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No												
FIRE <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No												
HAZ MAT <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No												
COM VEH <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No												
INSURANCE CO. <b>41-380-4131-00</b>												
DATE OF BIRTH <b>02/06/79</b>												
SEX <b>M</b>												
SAFT <b>2</b>												
AIR <b>2</b>												
EJECT <b>K</b>												
CLASS <b>2</b>												
TAKEN TO <b>Proctor</b>												
EMS AGENCY <b>Fulton</b>												
MAKE <b>Jeep</b>												
MODEL <b>Grand Cherokee</b>												
YEAR <b>2000</b>												
STATE <b>IL</b>												
CIRCLE NUMBER(S) FOR DAMAGED AREA(S) <b>11</b>												
TOWED DUE TO DAMAGE <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No												
OTHER <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No												
FIRE <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No												
HAZ MAT <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No												
COM VEH <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No												
INSURANCE CO. <b>41-380-4131-00</b>												
TELEPHONE <b>41-380-4131-00</b>												
POLICY NO. <b>41-380-4131-00</b>												
DAMAGED PROPERTY <b>1</b>												
CITATION NO. <b>61531</b>												
*P1099*												

5102776

DIAGRAM



NARRATIVE (Refer to vehicle by Unit No.)

Unit #1 was NB on Cott Hwy 24, 2 mi S. of Cottonwood Rd at this point Unit #1 left the roadway to the East. Unit #1 was skidding broadside and struck the embankment. Upon impact Unit #1 became airborne continuing E. into a soybean field. Unit #1 rolled over approx. 3 times. Unit #1 Driver was ejected from Unit #1 and was found approx 100' from Unit #1 to the North.

## COMMERCIAL VEHICLE

UNIT NO.

CARRIER NAME	SOURCE	
ADDRESS	<input type="checkbox"/> Side of truck	<input type="checkbox"/> Papers
CITY	STATE	ZIP
ID NUMBER	GVWR	<input type="checkbox"/> Driver
US DOT or State No.	ICCMC State Name	<input type="checkbox"/> Log book
HAZARDOUS MATERIALS:	PLAZARDED?	<input type="checkbox"/> None
If Yes: 4-Digits	1-Digit	<input type="checkbox"/> Yes <input type="checkbox"/> No
Hazardous cargo released from truck?	Y	N
(do not count fuel from vehicle fuel tank)	<input type="checkbox"/>	<input type="checkbox"/>
Violation of HAZMAT regs. contribute to crash?	<input type="checkbox"/>	<input type="checkbox"/>
Violation of MCS regs. contribute to crash?	<input type="checkbox"/>	<input type="checkbox"/>
Inspection form completed?	Y	N
HAZMAT	<input type="checkbox"/>	Out of Service?
MCS	<input type="checkbox"/>	Out of Service?
IDOT PERMIT #	WIDE LOAD <input type="checkbox"/>	
TRAILER WIDTH(S)	TRAILER LENGTH(S)	VEHICLE LENGTH (TOTAL) - #
Trailer 1 0-96" 97-102" Over 102"	Trailer 1	NO. OF AXLES
Trailer 2	Trailer 2	
(Circle)		
<input type="checkbox"/> IN CITY OF <input type="checkbox"/> NEAREST CITY: _____ Miles N E S W of:		
INSERT APPLICABLE NUMBERS FROM CHOICES ON BACK OF TEMPLATE TWO		
VEHICLE CONFIGURATION _____ CARGO BODY TYPE _____ LOAD TYPE _____		

## COMMERCIAL VEHICLE

UNIT NO.

CARRIER NAME	SOURCE	
ADDRESS	<input type="checkbox"/> Side of truck	<input type="checkbox"/> Papers
CITY	STATE	ZIP
ID NUMBER	GVWR	<input type="checkbox"/> Driver
US DOT or State No.	ICCMC State Name	<input type="checkbox"/> Log book
HAZARDOUS MATERIALS:	PLAZARDED?	<input type="checkbox"/> None
If Yes: 4-Digits	1-Digit	<input type="checkbox"/> Yes <input type="checkbox"/> No
Hazardous cargo released from truck?	Y	N
(do not count fuel from vehicle fuel tank)	<input type="checkbox"/>	<input type="checkbox"/>
Violation of HAZMAT regs. contribute to crash?	<input type="checkbox"/>	<input type="checkbox"/>
Violation of MCS regs. contribute to crash?	<input type="checkbox"/>	<input type="checkbox"/>
Inspection form completed?	Y	N
HAZMAT	<input type="checkbox"/>	Out of Service?
MCS	<input type="checkbox"/>	Out of Service?
IDOT PERMIT #	WIDE LOAD <input type="checkbox"/>	
TRAILER WIDTH(S)	TRAILER LENGTH(S)	VEHICLE LENGTH (TOTAL) - #
Trailer 1 0-96" 97-102" Over 102"	Trailer 1	NO. OF AXLES
Trailer 2	Trailer 2	
(Circle)		
<input type="checkbox"/> IN CITY OF <input type="checkbox"/> NEAREST CITY: _____ Miles N E S W of:		
INSERT APPLICABLE NUMBERS FROM CHOICES ON BACK OF TEMPLATE TWO		
VEHICLE CONFIGURATION _____ CARGO BODY TYPE _____ LOAD TYPE _____		



# ILLINOIS TRAFFIC CRASH REPORT

## TEMPLATE 1

Printed by authority of the State of Illinois

SR 1000A 2M (REPRINT 10/06)

EVENT (EVNT)		WEATHER CONDN. (WEAT)		TYPE OF FIRST CRASH (COLL)		PED/PEDAL LOCATION (PPL)		VEHICLE TYPE (VEHT)			
<b>NONCOLLISION:</b> 1 Ran off the roadway 2 Overturn 3 Fire/explosion 4 Immersion 5 Jackknife 6 Cargo shift/loss 7 Separation 8 Downhill runaway 9 Other noncollision 99 Unknown  <b>COLLISION WITH:</b> <b>NOT FIXED OBJECTS:</b> 11 Motor vehicle in traffic 12 Pedestrian 13 Pedalcyclist 14 Railway train 15 Deer 16 Other animal 17 Falling load 18 Parked vehicle 19 Thrown/falling object 20 Other object 99 Unknown  <b>FIXED OBJECTS:</b> 21 Crash cushion 22 Guardrail face 23 Guardrail end 24 Concrete med. barrier 25 Bridge support 26 Bridge end 27 Bridge rail 28 Bridge underside 29 Traffic signal 30 Light support 31 Utility pole 32 Delineator post 33 Railroad signal/gates 34 Other pole or post 35 Culvert 36 Curb 37 Ditch/embankment 38 Snowbank 39 Fence 40 Mailbox 41 Tree or shrub 42 Building/structure 43 Other fixed object 99 Unknown		<b>TRAFFIC CONTROL DEVICE (TRFD)</b> 1 No controls 2 Stop sign/flasher 3 Traffic signal 4 Yield 5 Police/flagman 6 RR crossing gate 7 Other RR crossing 8 School zone 9 No passing 10 Other reg. sign 11 Other warning sign 12 Lane use marking 13 Other 99 Unknown  <b>DEVICE CONDN. (TRFC)</b> 1 No controls 2 Not functioning 3 Functioning improperly 4 Functioning properly 5 Worn reflect. material 6 Missing 7 Other 9 Unknown		<b>SINGLE VEHICLE CRASH</b> Select a code for a Single Vehicle Crash based on the crash code that illustrates what caused the <b>first</b> damage/injury, not what caused the <b>most</b> severe damage/injury.  1 Pedestrian  2 Pedalcyclist  3 Train  4 Animal  5 Overturned  6 Fixed object  7 Other object  8 Other noncollision  Example: A motor vehicle skids on ice, loses control and strikes a guardrail. The <b>COLL</b> code should be <b>6 - Fixed object</b> because no damage occurred until the guardrail was struck.		<b>MULTI VEHICLE CRASH</b> The intended direction of travel of each motor vehicle prior to the onset of the crash should determine the selection of the Multi Vehicle Crash code, <b>not</b> the direction of travel or position/angle of the vehicle at the point of contact. If the <b>first</b> damage/injury occurs when two vehicles strike, you must select a code 9-15.  9 Parked motor vehicle  10 Turning (at least one vehicle turning)  11 Rear end  12 Sideswipe same direction  13 Sideswipe opposite direction  14 Head on  15 Angle  Example: Unit 1 is NB and Unit 2 is SB on a four-lane divided roadway. Unit 1 skids on ice, loses control, crosses the grass median, re-enters the roadway into oncoming traffic, and collides with Unit 2. The <b>COLL</b> code should be <b>14 - Head on</b> because no damage occurred until the two units collided.		<b>PED/PEDAL ACTION (PPA)</b> 3 Turning left 4 Turning right 20 Enter from drive/alley 50 No action 51 Crossing - with signal 52 Crossing - against signal  <b>ENTERING / LEAVING / CROSSING</b> 53 School bus (within 50 ft.) 54 Parked vehicle 55 Not at intersection  <b>WALKING / RIDING</b> 56 With traffic 57 Against traffic 58 To/from disabled vehicle  <b>OTHER:</b> 59 Waiting for school bus 60 Playing/working on vehicle 61 Playing in roadway 62 Standing in roadway 63 Working in roadway 64 Other action 99 Unknown/NA		<b>VEHICLE USE (VEHU)</b> 1 Not in use 2 Personal 3 Driver education 4 Ambulance 5 Fire 6 Police 7 School bus 8 CTA 9 Mass transit 10 Other transit 11 Military 12 Agriculture 13 Tow truck 14 Construction/maintenance 15 House trailer 16 Camper/RV - towed/multi-unit 17 Camper/RV - single unit 18 Taxi/for hire 20 Commercial - multi-unit 21 Commercial - single unit 22 State owned 98 Other 99 Unknown/NA	
<b>LIGHTING CONDN. (LGHT)</b> 1 Daylight 2 Dawn 3 Dusk 4 Darkness 5 Darkness, lighted road 9 Unknown		<b>VEHICLE MANEUVER PRIOR (MANV)</b> 1 Straight ahead 2 Passing/overtaking 3 Turning left 4 Turning right 5 Turning on red 6 U-turn 7 Starting in traffic 8 Slow/stop - left turn 9 Slow/stop - right turn 10 Slow/stop - load/unload 11 Slow/stop in traffic 12 Driving wrong way 13 Changing lanes 14 Avoiding vehicles/objects 15 Skidding/control loss 16 Entering traffic lane from parking 17 Leaving traffic lane to park 18 Merging 19 Diverging 20 Enter from drive/alley 21 Parked 22 Parked in traffic lane 23 Backing 24 Driverless 25 Other 26 Negotiating a curve 99 Unknown/NA		<b>CRASH DATA SAVES LIVES!</b>   <b>NUMBER OF OCCUPANTS (NO. OCCS)</b> <b>DIRECTION TRAVEL PRIOR (DIRP)</b> 							
<b>EVENT LOCATION (LOC)</b> 1 On pavement (roadway) 2 Off pavement - left 3 Off pavement - right 4 Intersection 5 Other 9 Unknown		<b>EVENT NUMBER (EVNO)</b> Unit No		<b>CHECK MOST SEVERE NUMBER (MOST)</b>							

# ILLINOIS TRAFFIC CRASH REPORT

## TEMPLATE 2

Printed by authority of the State of Illinois

SR 1000B 2M (REPRINT 10/06)

**APPARENT PHYSICAL CONDITION (DRAC)**

- 1 Normal
- 2 Impaired - alcohol
- 3 Impaired - drugs
- 4 Illness
- 5 Asleep/fainted
- 6 Medicated
- 7 Had been drinking
- 8 Fatigued
- 9 Other/unknown

**SEATING POSITION (SEAT)**

1	2	3
4	5	6
10	11	12
7 Enclosed passengers		
8 Exposed passengers		

**INJURY CLASSIF. (INJ)**

K Fatal  
A Incapacitating injury  
B Nonincapacitating injury  
C Reported, not evident  
D No indication of injury

**PED / BIKE VISIBILITY (PEDV)**

- 1 No contrasting clothing
- 2 Contrasting clothing
- 3 Reflective material
- 4 Other light source used

**SAFETY EQUIPMENT USED (SAFT)**

- 1 None present
- 2 Safety belt used
- 3 Safety belt not used
- 4 Helmet used
- 5 Helmet not used
- 6 Child restraint used
- 7 Child restraint used improperly
- 8 Child restraint not used
- 9 Usage Unknown

**AIR BAG DEPLOYED (AIR)**

- 3 Not applicable
- 4 Did not deploy
- 5 Deployed, front
- 6 Deployed, side
- 7 Deployed other (knee, air belt, etc.)
- 8 Deployed, combination
- 9 Deployment unknown

**DRIVER VISION (VIS)**

- 1 Not obscured
- 2 Windshield (water/ice)
- 3 Trees, plants
- 4 Buildings
- 5 Embankment
- 6 Signboard
- 7 Hillcrest
- 8 Parked vehicles
- 9 Moving vehicles
- 10 Blinded - headlights
- 11 Blinded - sunlight
- 12 Blowing materials
- 13 Other
- 99 Unknown

**DRIVER ACTION (DRVA)**

- 1 None
- 2 Failed to yield
- 3 Disregarded control devices
- 4 Too fast for conditions
- 5 Improper turn
- 6 Wrong way/side
- 7 Followed too closely
- 8 Improper lane change
- 9 Improper backing
- 10 Improper passing
- 11 Improper parking
- 12 License restrictions
- 13 Stopped school bus
- 14 Emergency vehicle on call
- 15 Evading police vehicle
- 16 Other
- 99 Unknown

**VEHICLE DEFECTS (VEHD)**

- 1 None
- 2 Brakes
- 3 Steering
- 4 Engine/motor
- 5 Suspension
- 6 Tires
- 7 Exhaust
- 8 Lights
- 9 Signals
- 10 Windows
- 11 Restraint system
- 12 Wheels
- 13 Trailer coupling
- 14 Cargo
- 15 Fuel system
- 16 Other
- 99 Unknown

**Private Property:** This is not the area to indicate that there was private property damage. Check **Yes** only if the crash began on, ended on and all damage occurred on private property.

If the crash began on a public roadway, it is not a private property crash; check **No**.

**EJECTION OR EXTRICATION (EJCT)**

- 1 None
- 2 Totally ejected
- 3 Partially ejected
- 4 Trapped/extricated
- 9 Unknown

**TRAFFICWAY DESCRIPTION (TRFW)**

TWO-WAY	OTHER
1 Not divided	5 One-way or ramp
2 Divided, no median barrier	6 Alley or driveway
3 Divided w/median barrier	7 Parking lot
4 Center turn lane	8 Other
	9 Unknown

**NUMBER OF LANES (NO. LANES)**

Count through lanes, both directions. If at intersection, use "0" (zero).

**ALIGNMENT (ALGN)**

1 Straight and level	4 Curve, level
2 Straight on grade	5 Curve on grade
3 Straight on hillcrest	6 Curve on hillcrest

**ROADWAY SURFACE CONDITION (RSUR)**

1 Dry	4 Ice
2 Wet	5 Sand, mud, dirt
3 Snow or slush	6 Other
	9 Unknown

**ROAD DEFECTS (RDEF)**

1 No defects	6 Shoulders
2 Construction zone	7 Rut, holes
3 Maintenance zone	8 Worn surface
4 Utility work zone	9 Debris on roadway
5 Work zone - unk.	10 Other
	99 Unknown

**Intersection Related:** Was this an intersection related crash? A crash does not have to actually occur at an intersection to be considered intersection related. For example, if 5 vehicles are lined up at a traffic signal and a rear end collision occurs at the back of the line, 75 feet from the intersection, it is intersection related.

**DRIVER BAC TEST RESULT (BAC)**

Enter BAC result or one of the following:

95 Test refused  
96 Test not offered  
97 Test performed results unknown

If drug test was given put in the narrative

**UNIT NO.**

**DATE OF BIRTH**  
mo/day/yr

**PASSENGERS & WITNESSES**  
Full Name, Address, Telephone

**TAKEN TO (hospital)**

**EMS RUN NUMBER or AGENCY NAME**



## 5.0 Examples

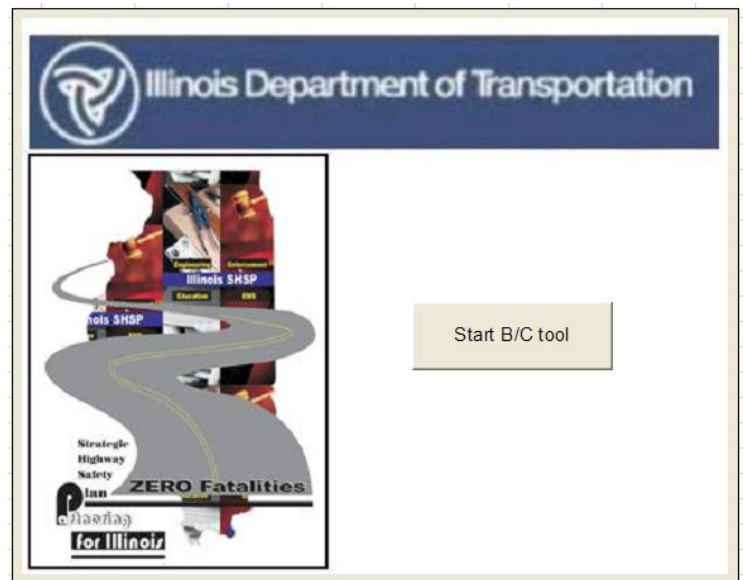
### 5.1 Case Study 1: **Benefit Cost Analysis for a Segment.**

The rural 2-lane state highway segment along IL 0 between Maple Street and Oak Street was identified as a hazardous location. It is located in District 10, Wooded County, in the Village of Forest. From 2003 to 2008 there were 2 fatal crashes, 2 A-injury crashes, and 1 B-injury crashes. There were also C-injury crashes and property damage only crashes at this location, but the exact number is not needed for this analysis. There are 2 night time crashes, 1 A-injury and 1 B-injury. The majority of the crashes were fixed object and overturn.

Countermeasures were reviewed and benefit-cost calculations were conducted to select the recommended solution. This example reflects the step-by-step procedure for calculating the benefit-cost ratio for adding rumble strips to the existing shoulder.

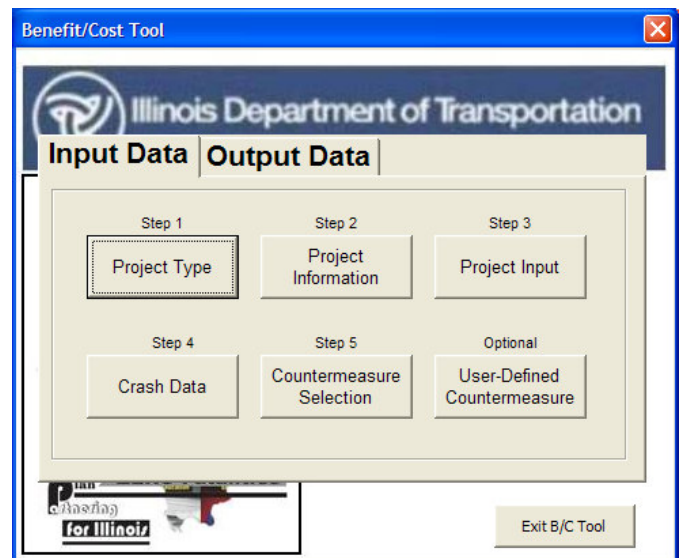
#### *Step-by-Step Procedure*

STEP 1: Start by pressing the **Start B/C Tool** button.



STEP 2: Select the **Input Data** tab.

STEP 3: Select the button labeled **Project Type**.



**Project Type Selection**

Road System  
☒ State ☐ Local

Project Type  
☐ Intersection ☒ Segment

Segments Peer Groups  
☒ PG1 - Rural Two-Lane Highway  
☐ PG2 - Rural Multilane Undivided Highway  
☐ PG3 - Rural Multilane Divided Highway  
☐ PG4 - Rural Freeway, 4 Lanes  
☐ PG5 - Rural Freeway 6+ Lanes  
☐ PG6 - Urban Two-Lane Highway  
☐ PG7 - Urban One-Way Arterial  
☐ PG8 - Urban Multilane Undivided Highway  
☐ PG9 - Urban Multilane Divided Highway  
☐ PG10 - Urban Freeway 4 Lanes  
☐ PG11 - Urban Freeway 6 Lanes  
☐ PG12 - Urban Freeway 8+ Lanes

Return to Main

STEP 4: Select roadway system by clicking on the circle next to **State**. Select **Segment** under Project Type. Select **PG1-Rural Two-Lane Highway** under Segments Peer Groups.

When complete click on the **Return to Main** button to return to the main input window.

**Benefit/Cost Tool**

Illinois Department of Transportation

Input Data | Output Data

Step 1: Project Type  
 Step 2: Project Information  
 Step 3: Project Input  
 Step 4: Crash Data  
 Step 5: Countermeasure Selection  
 Optional: User-Defined Countermeasure

Exit B/C Tool

STEP 5: On the main menu, select the button labeled **Project Information**.

**Project Information**

Project : IL0 Segment Improvement

District: 10 County: Wooded City: Forest

Key Route: 063 81000 000000 Marked Route: IL0 MilePost:

Location : Rural 2-Lane State Highway segment between Maple Street and Oak Street

Prepared by : JD Date (mm/dd/yyyy) : 01/20/2011

Return to Main

STEP 6: Complete the information in the boxes as shown. When all fields have been completed, click on **Return to Main**.

STEP 7: Select the button labeled **Project Input**.

Benefit/Cost Tool

Illinois Department of Transportation

Input Data | Output Data

Step 1: Project Type

Step 2: Project Information

Step 3: Project Input

Step 4: Crash Data

Step 5: Countermeasure Selection

Optional: User-Defined Countermeasure

Exit B/C Tool

STEP 8: Input the information requested in the fields of the **Segment Input** window. When complete with all fields click on **Return to Main**.

Segment Input

Crash Data : From 2003 to 2008

Current AADT : 9500

Length (Miles) : 2.3

Specify a value between 1 to 5%

Traffic Growth: 1.25

Discount rate: 3.00

Return to Main

STEP 9: Select the button labeled **Crash Data**.

Benefit/Cost Tool

Illinois Department of Transportation

Input Data | Output Data

Step 1: Project Type

Step 2: Project Information

Step 3: Project Input

Step 4: Crash Data

Step 5: Countermeasure Selection

Optional: User-Defined Countermeasure

Exit B/C Tool



**Crash Data**

Crash Data Availability

What type of crash data do you have available? :

☒ Crash Severity Distribution by Crash type

☐ Aggregate Crash Severity Distribution

Crash Data - Condition Related

Do you have night time crashes and will analyze a night time countermeasure? : ☐ Yes

Do you have wet pavement crashes and will analyze a wet pavement countermeasure? : ☐ Yes

**Enter Crash Data**

STEP 10: Select **Crash Severity Distribution by Crash Type** by clicking on the circle next to the text. When complete, select the **Enter Crash Data** button.

STEP 11: Enter crash data for the analysis period by crash type and severity as shown. When complete, select the **Return to Main** button.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
1	<b>SEGMENT CRASH SEVERITY DISTRIBUTION BY CRASH TYPE FOR ANALYSIS PERIOD - ALL CRASHES</b>																	
2		Angle	Animal	Fixed Object	Head On	Left Turn	Other Noncollision	Other Object	Overtaken	Pedestrian	Pedalcyclist	Parked Vehicle	Rear End	Right Turn	Sideswipe Same Direction	Sideswipe Opposite Direction	Turning	Train
3																		
4		AG	AN	FO	HO	LT	OtherNC	OtherO	OVT	PD	PDC	PKV	RE	RT	SSD	SOD	T	TR
5	Fatal Crashes	1		1					3									
6	A-Injury Crashes			2	1				1									
7	B-Injury Crashes			5	1		1		1							1	1	
8	C-Injury Crashes								1									
9	PDO Crashes																	

**Benefit/Cost Tool**

Illinois Department of Transportation

**Input Data** | **Output Data**

Step 1: Project Type

Step 2: Project Information

Step 3: Project Input

Step 4: Crash Data

Step 5: Countermeasure Selection

Optional: User-Defined Countermeasure

**Exit B/C Tool**

STEP 12: Select the button labeled **Countermeasure Selection**.

STEP 13: Select 2.1.8.1 Install Rumble Strips (Shoulder) from the countermeasures dropdown menu.

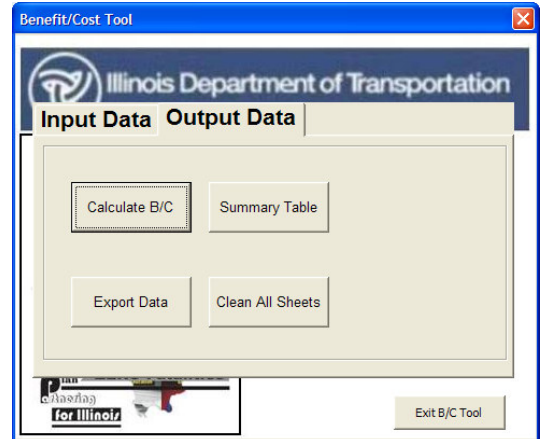
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1															
2	<b>SEGMENTS BENEFIT COST ANALYSIS</b>														
3	<b>BENEFIT CALCULATIONS</b>										<b>COUNTERMEASURE COST CALCULATIONS</b>				
4															
5															
6	<b>COUNTERMEASURE</b>				<b>CMF**</b>		<b>Crash Type affected by this improvement</b>				<b>Unit Cost</b>	<b>Quantity</b>	<b>Units</b>	<b>Total Cost</b>	<b>Service Life</b>
7	2.1.8.S11 Install Rumble Strips (Shoulder)				▼ 0.78		FO, CVT				\$5,000	4.6	Miles	\$41,400	8
8					▼		All							\$0	
9					▼		All							\$0	
10					▼		All							\$0	
11					▼		All							\$0	
12															
13															
14															
15															
16															
17	* CMF= Crash Modification Factor														
18	** EUAC = Estimated Uniform Annual Cost														
19															

[Return to Main](#)

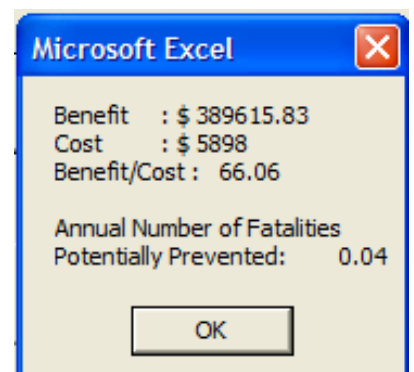
STEP 14: Enter the **Unit Cost** and **Quantity** for the selected countermeasure. When complete, select **Return to Main**.

When all input data has been completed, select the **Output Data** tab on the main menu and the screen below will appear.

STEP 15: Click on the **Calculate B/C** button to obtain the benefit-cost ratio.



The image to the right will appear with the benefit-cost ratio for this project. Click the **OK** button to return to the main menu.



Benefit/Cost Tool

Illinois Department of Transportation

Input Data Output Data

Calculate B/C Summary Table

Export Data Clean All Sheets

Planning for Illinois

Exit B/C Tool

If you would like to save the run, select **Export Data**. This will allow you to save the file with a new name. The file can be opened at later data and modified if necessary.

### 5.2 Case Study 2: **Benefit Cost Analysis for a Signalized Intersection.**

The signalized intersection of Maple Street and Oak Street was identified as a hazardous location. It is located in District 0, Wooded County, in the Village of Forest. From 2003 to 2008 there were 2 fatal crashes, 38 A-injury crashes, and 63 B-injury crashes. There were also C-injury and property damage only crashes at this location. A majority of the crashes were angle and turning with turning representing the most severe crash type.

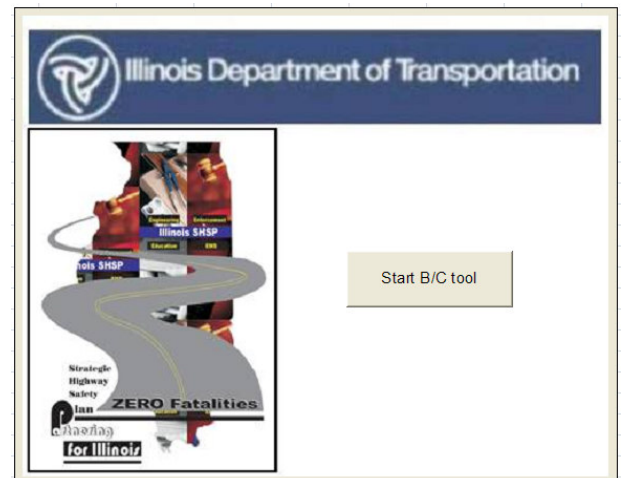
A road safety assessment was conducted and it was determined that there is a high left turn volume from a shared thru lane. The traffic signal heads were also difficult to see from a distance.

Countermeasures were reviewed and benefit-cost calculations were conducted to select the recommended solution. This example reflects the step-by-step procedure for calculating the benefit-cost ration for adding two countermeasures; an increase in the signal lens size to 12 inches for the intersection and a left turn phase for two legs of the intersection.

In this example, the first b/c calculation will be for treatment of two legs of the intersection with the increase in signal lens size. The second calculation will be for treatment of the other two legs of the intersection with an increase in signal lens size and the addition of left turn phases.

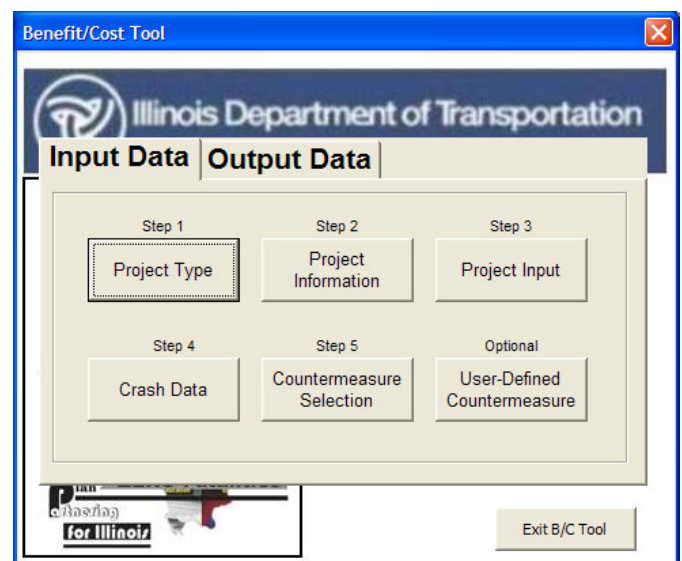
#### *Step-by-Step Procedure*

STEP 1: Start by pressing the **Start B/C Tool** button.



STEP 2: Select the **Input Data** tab.

STEP 3: Select the button labeled **Project Type**.



**Project Type Selection**

Road System  
☒ State ☐ Local

Project Type  
☒ Intersection ☐ Segment

Intersections Peer Groups  
☐ PG1 - Rural Minor Leg Stop Control  
☐ PG2 - Rural All-Way Stop Control Intersection  
☐ PG3 - Rural Signalized Intersection  
☐ PG4 - Rural Undetermined Intersection  
☐ PG5 - Urban Minor Leg Stop Control Intersection  
☐ PG6 - Urban All-Way Stop Control Intersection  
☒ PG7 - Urban Signalized Intersection  
☐ PG8 - Urban Undetermined Intersection

Return to Main

STEP 4: Select roadway system by clicking on the circle next to **State**. Select **Intersection** under Project Type. Select **PG7-Urban Signalized Intersection** under Intersection Peer Groups.

When complete click on the **Return to Main** button to return to the main input window.

**Benefit/Cost Tool**

Illinois Department of Transportation

Input Data | Output Data

Step 1: Project Type  
 Step 2: Project Information  
 Step 3: Project Input  
 Step 4: Crash Data  
 Step 5: Countermeasure Selection  
 Optional: User-Defined Countermeasure

Exit B/C Tool

STEP 5: On the main menu, select the button labeled **Project Information**.

**Project Information**

Project : Intersection Improvement - Maple Street and Oak Street

District : 0 County : Wooded City : Forest

Key Route : Marked Route : S176 MilePost : 0.8

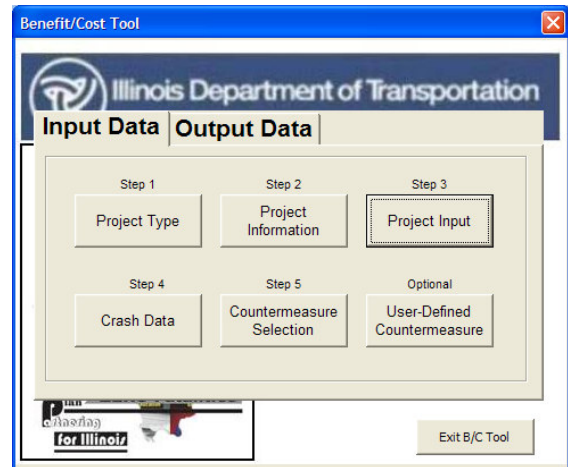
Location : Urban State Signalized Intersection of Maple St & Oak St

Prepared by : JD Date (mm/dd/yyyy) : 01/20/2011

Return to Main

STEP 6: Complete the information in the boxes as shown. When all fields have been completed, click on **Return to Main**.

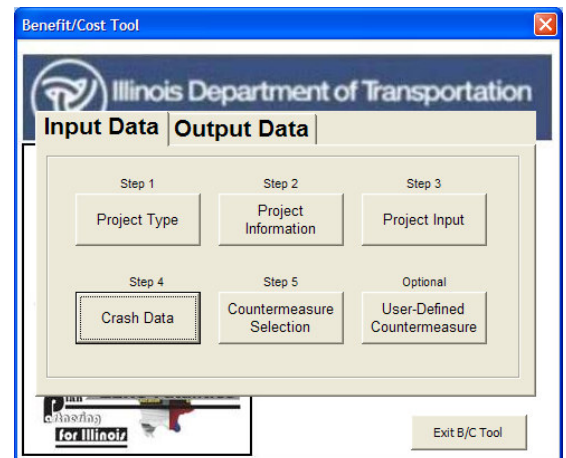
STEP 7: Select the button labeled **Project Input**.



STEP 8: Input the information requested in the fields of the **Intersection Input** window. When complete with all fields click on **Return to Main**.

The screenshot shows the 'Intersection Input' window. It contains several input fields: 'Crash Data' with 'From' set to 2003 and 'to' set to 2008; 'Current AADT' with 'Major approach' set to 32000 and 'Minor approach' set to 2000; 'Traffic Growth' set to 1.25; and 'Discount rate' set to 3.00. A note specifies 'Specify a value between 1 to 5%' for the Traffic Growth field. A 'Return to Main' button is located at the bottom right.

STEP 9: Select the button labeled **Crash Data**.



**Crash Data**

Crash Data Availability

What type of crash data do you have available? :

☒ Crash Severity Distribution by Crash type

☐ Aggregate Crash Severity Distribution

Crash Data - Condition Related

Do you have night time crashes and will analyze a night time countermeasure? : ☐ Yes

Do you have wet pavement crashes and will analyze a wet pavement countermeasure? : ☐ Yes

**Enter Crash Data**

STEP 10: Select **Crash Severity Distribution by Crash Type** by clicking on the circle next to the text. When complete, select the **Enter Crash Data** button.

STEP 11: Enter crash data for the analysis period by crash type and severity as shown. Crash data entered should only be for the two legs of the intersection that are going to be treated with increasing lens size only. When complete, select the **Return to Main** button.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
1	<b>INTERSECTION CRASH SEVERITY DISTRIBUTION BY CRASH TYPE FOR ANALYSIS PERIOD - ALL CRASHES</b>																	
2																		
3		Angle	Animal	Fixed Object	Head On	Left Turn	Other Noncollision	Other Object	Overtaken	Pedestrian	Pedalcyclist	Parked Vehicle	Rear End	Right Turn	Sideswipe Same Direction	Sideswipe Opposite Direction	Turning	Train
4		AG	AN	FO	HO	LT	OtherNC	OtherO	OVT	PD	PDC	PKV	RE	RT	SSD	SOD	T	TR
5	Fatal Crashes					1												
6	A-Injury Crashes	3				5							2				4	
7	B-Injury Crashes	6				10							3	1	1		7	
8	C-Injury Crashes																	
9	PDO Crashes																	

STEP 12: Select the button labeled **Countermeasure Selection**.

**Benefit/Cost Tool**

Illinois Department of Transportation

**Input Data** | **Output Data**

Step 1: Project Type

Step 2: Project Information

Step 3: Project Input

Step 4: Crash Data

Step 5: **Countermeasure Selection**

Optional: User-Defined Countermeasure

**Exit B/C Tool**

STEP 13: Select 1.4.6.I7.1 Increase to 12 Inch Lens from the countermeasure dropdown menu.

INTERSECTION BENEFIT COST ANALYSIS									
BENEFIT CALCULATIONS					COUNTERMEASURE COST CALCULATIONS				
COUNTERMEASURE	CMF*	Crash Type affected by this improvement	Unit Cost	Quantity	Units	Total Cost	Service Life		
1.4.6.I7.1 Increase to 12 Inch Lens	0.97	All	\$10,000	2	Unit Qty	\$20,000	10		
		All				\$0			
		All				\$0			
		All				\$0			
		All				\$0			

\*\*\*NOTE: IF THE NUMBER OF LEGS AFFECTED VARIES BY COUNTERMEASURES SELECTED, THEN CALCULATE THE BENEFIT-COST RATIO FOR EACH COUNTERMEASURE SEPARATELY (Use separate spreadsheets for each countermeasure applied).

\* CMF = Crash Modification Factor  
 \*\* EUAC = Estimated Uniform Annual Cost

Return to Main

STEP 14: Enter the **Unit Cost** and **Quantity** for the selected countermeasures. The unit cost should be the cost for increasing the lens size on one leg of the intersection. The quantity represents the number of legs which the countermeasure will be applied. When complete, select **Return to Main**.

When all input data has been completed, select the **Output Data** tab on the main menu and the screen shown below will appear.

STEP 15: Click on the **Calculate B/C** button to obtain the benefit-cost ratio.

The screenshot shows the 'Benefit/Cost Tool' window with the 'Output Data' tab selected. The interface includes buttons for 'Calculate B/C', 'Summary Table', 'Export Data', and 'Clean All Sheets'. The Illinois Department of Transportation logo is visible at the top.

The image to the right will appear with the benefit-cost ratio for this project. Click the **OK** button to return to the main menu.

The screenshot shows a 'Microsoft Excel' dialog box with the following data:

Benefit	: \$ 89072.75
Cost	: \$ 2345
Benefit/Cost	: 37.98
Annual Number of Fatalities Potentially Prevented:	0.01

OK



[illegible]

The analysis for treating two legs of the intersection with increasing the lens size is complete. To treat the other two legs of the intersection with an increase in lens size and the addition of left turn phases, continue with the following steps.

Benefit/Cost Tool

Illinois Department of Transportation

Input Data Output Data

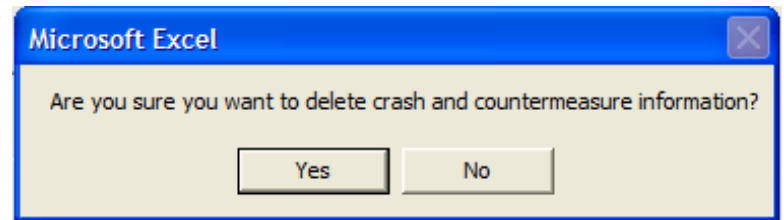
Calculate B/C Summary Table

Export Data Clean All Sheets

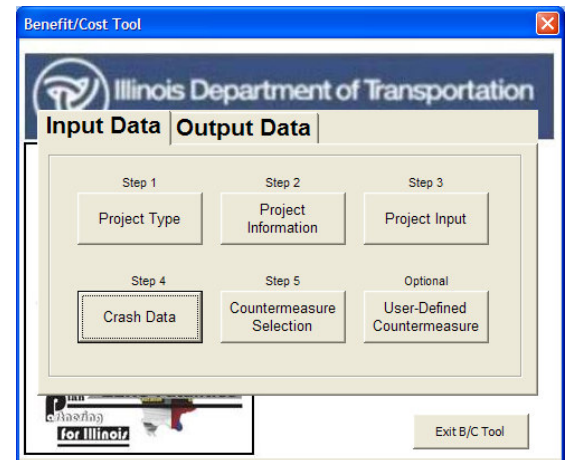
for Illinois

Exit B/C Tool

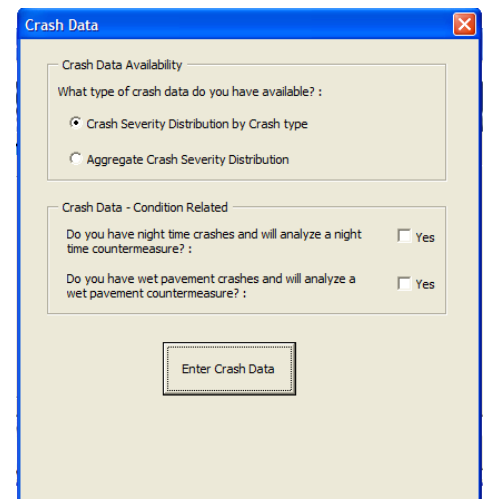
STEP 18: Click **Yes** to confirm.



STEP 19: Select the button labeled **Crash Data**.



STEP 20: Select **Crash Severity Distribution by Crash Type** by clicking on the circle next to the text. When complete, select the **Enter Crash Data** button.



STEP 21: Enter the crash data for the analysis period by crash type and severity for the crashes on the legs of the intersection that will be treated with increasing the lens size and the addition of the left turn lanes. Crashes should appear on only one of the two B/C analyses, not both so that there is not double counting of crashes. When complete, select the **Return to Main** button.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
1	<b>INTERSECTION CRASH SEVERITY DISTRIBUTION BY CRASH TYPE FOR ANALYSIS PERIOD - ALL CRASHES</b>																	
2		Angle	Animal	Fixed Object	Head On	Left Turn	Other Noncollision	Other Object	Overtaken	Pedestrian	Pedalcyclist	Parked Vehicle	Rear End	Right Turn	Sideswipe Same Direction	Sideswipe Opposite Direction	Turning	Train
3																		
4		AG	AN	FO	HO	LT	OtherNC	OtherO	OVT	PD	PDC	PKV	RE	RT	SSD	SOD	T	TR
5	Fatal Crashes					1							4			8		
6	A-Injury Crashes	4				8												
7	B-Injury Crashes	7				15							1		2	10		
8	C-Injury Crashes																	
9	PDO Crashes																	

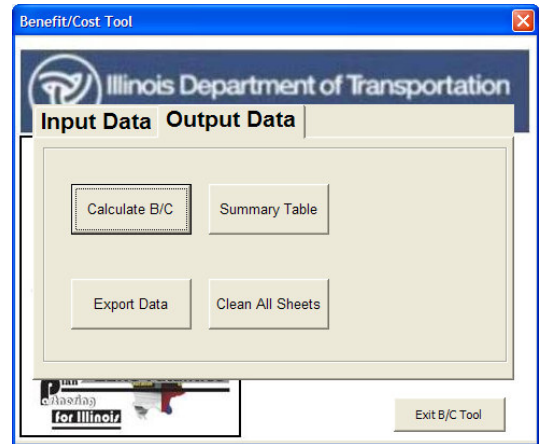
STEP 22: Select the button labeled **Countermeasure Selection**.

STEP 23: Select 1.2.11.I7.1 Add Left Turn Lane (Existing Signalized, Four-Leg Intersection) and 1.4.6.I7.1 Increase to 12 Inch Lens from the countermeasure dropdown menu.

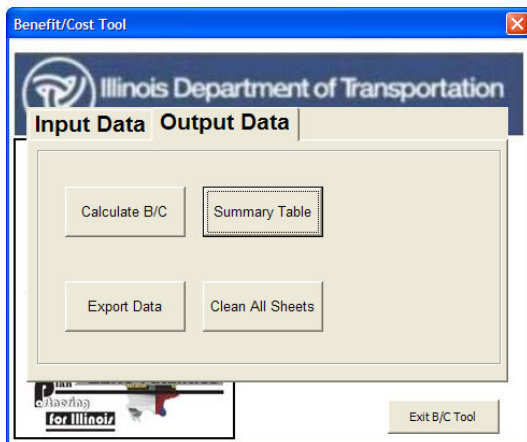
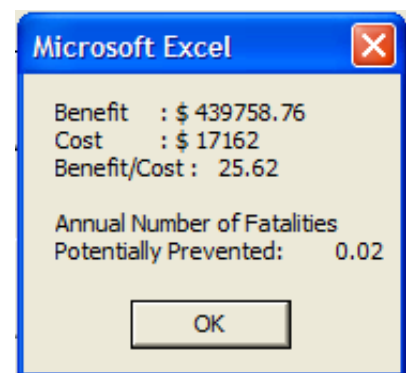
STEP 24: Enter the **Unit Cost** and **Quantity** for the selected countermeasures. When complete, select **Return to Main**.  
When all input data has been completed, select the **Output Data** tab on the main menu.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	<b>INTERSECTION BENEFIT COST ANALYSIS</b>														
2	<b>BENEFIT CALCULATIONS</b>										<b>COUNTERMEASURE COST CALCULATIONS</b>				
3															
4															
5															
6	<b>COUNTERMEASURE</b>					<b>CMF*</b>	<b>Crash Type affected by this improvement</b>			<b>Unit Cost</b>	<b>Quantity</b>	<b>Units</b>	<b>Total Cost</b>	<b>Service Life</b>	
7	1.2.11.I7.1 Add Left Turn Lane (Existing Signalized, Four-Leg Intersection)					0.91	All			\$85,000	2	Unit Qty	\$170,000	15	
8															
9	1.4.6.I7.1 Increase to 12 Inch Lens					0.97	All			\$10,000	2	Unit Qty	\$20,000	10	
10															
11															
12															
13															
14															
15															

STEP 25: Click on the **Calculate B/C** button to obtain the benefit-cost ratio.



The image to the right will appear with the benefit-cost ratio for this project. Click the **OK** button to return to the main menu.



STEP 26: Select **Summary Table** to see a summary of the analysis or to verify inputs.

The window below will appear when **Summary Table** is selected.

If you would like to save the run, select **Export Data**. This will allow you to save the file with a new name. The file can be opened at a later date and modified if necessary. After completing the two benefit-cost analyses, a combined b/c ratio can be obtained by adding the benefits and dividing by the sum of the total costs. The sum of the total costs for this example is \$19,507 and the total benefit is \$528,831. The composite B/C is 27.11.



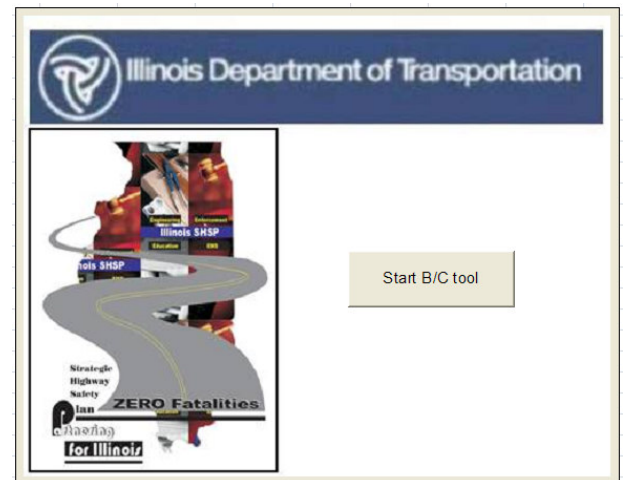
### 5.3 Case Study 3: **Benefit Cost Analysis for a Systematic Improvement.**

This case study shows an analysis for systematic improvements at a series of locations that present similar types of risk or recurring number of crashes of certain types. The sites are located in District 10, and they are they with 14 different counties boundaries. A major crash pattern and risk at the different sites is associated with lack of warning signals and roadway markings.

This example reflects the step-by-step procedure for calculating the benefit-cost ratio for adding two types of warning signs and roadway markings to the existing sites.

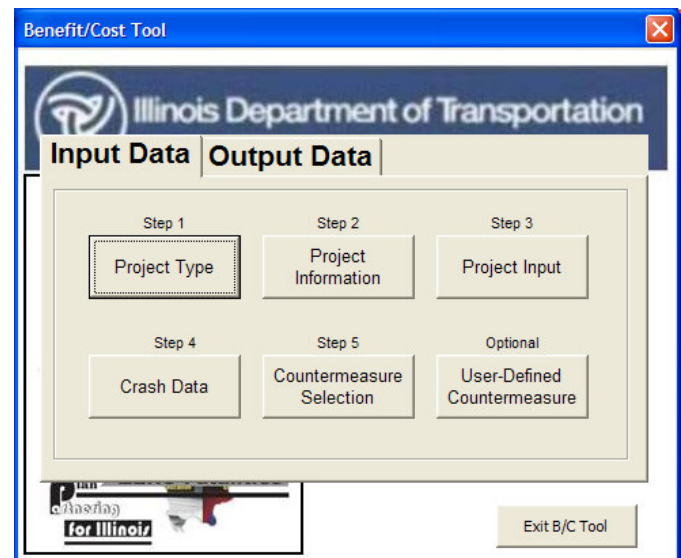
#### *Step-by-Step Procedures*

STEP 1: Start by pressing the **Start B/C Tool** button.



STEP 2: Select the **Input Data** tab.

STEP 3: Select the button labeled **Project Type**.



**Project Type Selection**

Road System  
☒ State ☐ Local

Project Type  
☐ Intersection ☒ Segment

Segments Peer Groups

- ☒ PG1 - Rural Two-Lane Highway
- ☐ PG2 - Rural Multilane Undivided Highway
- ☐ PG3 - Rural Multilane Divided Highway
- ☐ PG4 - Rural Freeway, 4 Lanes
- ☐ PG5 - Rural Freeway 6+ Lanes
- ☐ PG6 - Urban Two-Lane Highway
- ☐ PG7 - Urban One-Way Arterial
- ☐ PG8 - Urban Multilane Undivided Highway
- ☐ PG9 - Urban Multilane Divided Highway
- ☐ PG10 - Urban Freeway 4 Lanes
- ☐ PG11 - Urban Freeway 6 Lanes
- ☐ PG12 - Urban Freeway 8+ Lanes

Return to Main

STEP 4: Select roadway system by clicking on the circle next to **State**. Select **Segment** under Project Type. Select **PG1-Rural Two Lane Highway** under Segment Peer Groups.

When complete click on the **Return to Main** button to return to the main input window.

**Benefit/Cost Tool**

Illinois Department of Transportation

Input Data | **Output Data**

Step 1: Project Type | **Step 2: Project Information** | Step 3: Project Input

Step 4: Crash Data | Step 5: Countermeasure Selection | Optional: User-Defined Countermeasure

Exit B/C Tool

STEP 5: On the main menu, select the button labeled **Project Information**.

**Project Information**

Project : Signing and Markings-Systematic Improvements

District: 10 County: City:

Key Route: Marked Route: MilePost:

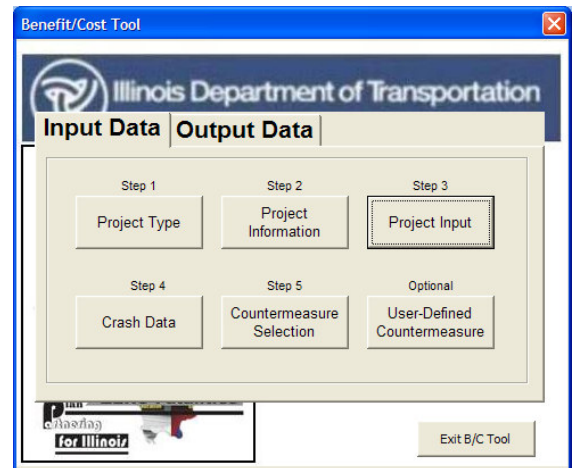
Location : Multiple Locations, 14 Counties

Prepared by : JD Date (mm/dd/yyyy) : 01/20/2011

Return to Main

STEP 6: Complete the information in the boxes as shown. When all fields have been completed, click on **Return to Main**.

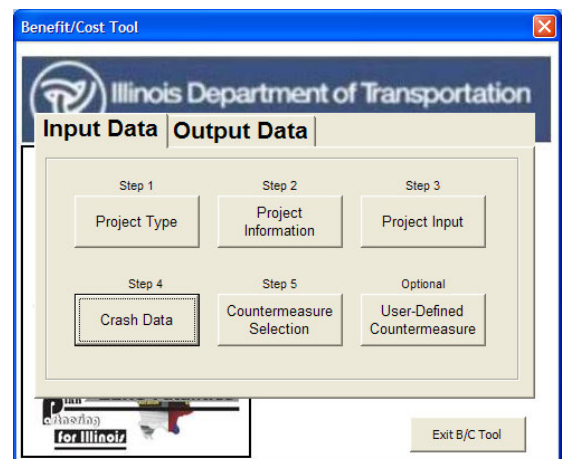
STEP 7: Select the button labeled **Project Input**.



STEP 8: Input the information requested in the fields of the **Segment Input** window. When complete with all fields click on **Return to Main**.

The 'Segment Input' window contains several input fields: 'Crash Data' with a range from '2003' to '2008'; 'Current AADT' with the value '3500-12000'; 'Length (Miles)' which is empty; 'Traffic Growth' with a value of '1.25' and a note to 'Specify a value between 1 to 5%'; and 'Discount rate' with a value of '3.00'. A 'Return to Main' button is located at the bottom right.

STEP 9: Select the button labeled **Crash Data**.





**Crash Data**

Crash Data Availability

What type of crash data do you have available? :

☒ Crash Severity Distribution by Crash type

☐ Aggregate Crash Severity Distribution

Crash Data - Condition Related

Do you have night time crashes and will analyze a night time countermeasure? : ☐ Yes

Do you have wet pavement crashes and will analyze a wet pavement countermeasure? : ☐ Yes

**Enter Crash Data**

STEP 10: Select **Crash Severity Distribution by Crash Type** by clicking on the circle next to the text. When complete, select the **Enter Crash Data** button.

STEP 11: Enter crash data for the analysis period by crash type and severity as shown. When complete, select the **Return to Main** button.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
1	<b>SEGMENT CRASH SEVERITY DISTRIBUTION BY CRASH TYPE FOR ANALYSIS PERIOD - ALL CRASHES</b>																	
2		Angle	Animal	Fixed Object	Head On	Left Turn	Other Noncollision	Other Object	Overtaken	Pedestrian	Pedalcyclist	Parked Vehicle	Rear End	Right Turn	Sideswipe Same Direction	Sideswipe Opposite Direction	Turning	Train
3		AG	AN	FO	HO	LT	OtherNC	OtherO	OVT	PD	PDC	PV	RE	RT	SSD	SOD	T	TR
4		AG	AN	FO	HO	LT	OtherNC	OtherO	OVT	PD	PDC	PV	RE	RT	SSD	SOD	T	TR
5	Fatal Crashes	1		1	2				2				1				1	
6	A-Injury Crashes	15		7	1			1	12		1		8			1	9	
7	B-Injury Crashes	9	1	15	6		4	3	12	1			20			4	13	
8	C-Injury Crashes																	
9	PDO Crashes																	

**Benefit/Cost Tool**

Illinois Department of Transportation

**Input Data** | **Output Data**

Step 1: Project Type

Step 2: Project Information

Step 3: Project Input

Step 4: Crash Data

Step 5: Countermeasure Selection

Optional: User-Defined Countermeasure

**Exit B/C Tool**

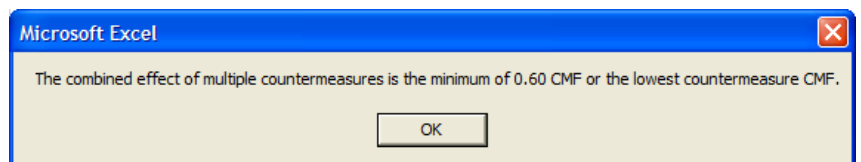
STEP 12: Select the button labeled **Countermeasure Selection**.

STEP 13: Select 2.3.S1.1 Install Edge Lines, Centerlines, and Post Mounted Delineators, 2.6.7.S1.1 Install Chevron Signs on Horizontal Curves, and 2.6.5.AL.1 Install Advanced Curve/Speed Warning Sign.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	
1																
2	SEGMENTS BENEFIT COST ANALYSIS															
3	BENEFIT CALCULATIONS										COUNTERMEASURE COST CALCULATIONS					
4																
5																
6	COUNTERMEASURE				CMF*	Crash Type affected by this improvement					Unit Cost	Quantity	Units	Total Cost	Service Life	
7	2.3.6.S11 Install Edgelines, Centerlines and Post Mounted Delimiters				▼	0.55	All					\$84,000	1	Miles	\$84,000	1
8																
9	2.6.7.S11 Install Chevron Signs on Horizontal Curves				▼	0.84	All					\$84,000	1	Unit Qty	\$84,000	4
10																
11	2.6.5.AL1 Install Advanced Curve Speed/Warning Sign				▼	0.87	All					\$84,000	1	Unit Qty	\$84,000	5
12																
13					▼		All								\$0	
14																
15																
16																
17	* CMF= Crash Modification Factor															
18	** EUAC = Estimated Uniform Annual Cost															
19																
20																
21	STEP - 1		Enter the list of potential countermeasures selected from the drop down menus													
22	STEP - 2		Enter "Unit Cost" for the countermeasure selected													
23	STEP - 3		Update the "Quantity" for each countermeasure selected for cost calculations													
24			(Example: If Shoulder Rumble Strips are selected for a 3-mile segment in both directions, then the "Quantity = (3x2) = 6")													
25																

STEP 14: Enter the **Unit Cost** and **Quantity** for the selected countermeasures. When complete, select **Return to Main**.

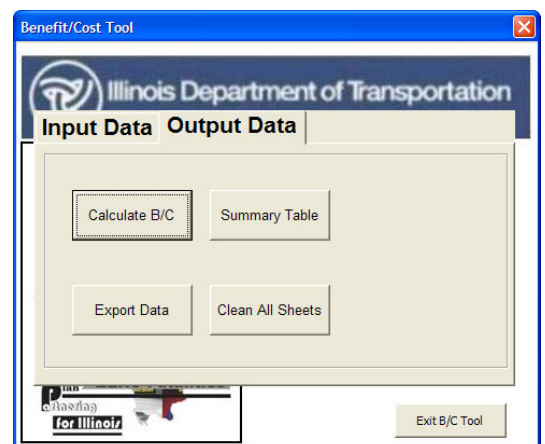
On selection of **Return to Main**, the following message will appear to notify the user that the combined effect of multiple countermeasures will



be limited to the minimum of 0.60 or the lowest selected CMF. In this example, Install Edgelines, Centerlines, and Post Mounted Delineators have a CMF of 0.55; therefore the combined CMF for all selected countermeasures will equal 0.55. Select **OK**.

When all input data has been completed, select the **Output Data** tab on the main menu and the screen shown below will appear.

STEP 15: Click on the **Calculate B/C** button to obtain the benefit-cost ratio.





#### 5.4 Case Study 4: Benefit Cost Analysis for a Segment Median Improvement

A rural four-lane freeway segment along a 10 mile stretch of I-80 was identified as a hazardous location. It is located in District 10, Wooded County, in the Village of Forest. From 2004 to 2008 there were 3 fatal crashes, 10 A-injury crashes, and 11 B-injury crashes. There are 6 wet pavement crashes, 1 Fatal, 3 A-injury and 2 B-injury. The majority of the crashes was head-on and overturns. 2008 traffic volumes show a segment AADT of 18,000.

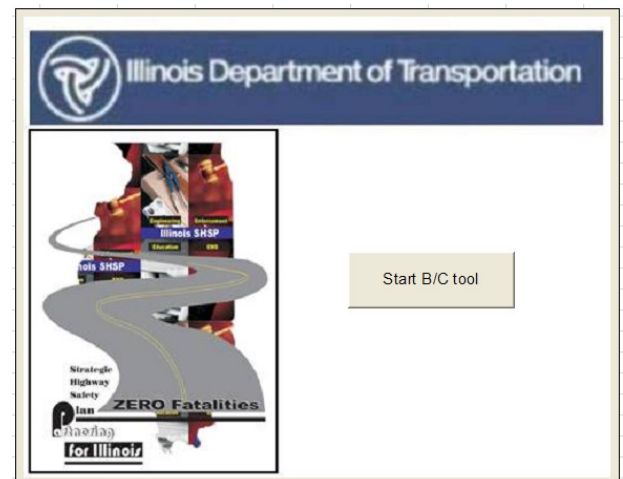
A road safety assessment was conducted and it was determined that the road has not been resurfaced, resulting in poor roadway friction. Furthermore, the median between eastbound and westbound I-80 has steep side slopes and does not have any barrier treatments. Cross median crashes frequently resulted in an overturned vehicle.

Countermeasures were reviewed and benefit-cost calculations were conducted to select the recommended solution. This example reflects the step-by-step procedure for calculating the benefit-cost ratio by adding three countermeasures. A de-slicking treatment was selected to address the crashes associated with poor pavement friction. A combination of improving median side slopes and installing a cable median barrier was selected to address the head on and overturned crashes.

This example highlights how wet pavement crashes are handled in the BC Tool and also highlights some of the warning messages a user may encounter while completing an analysis.

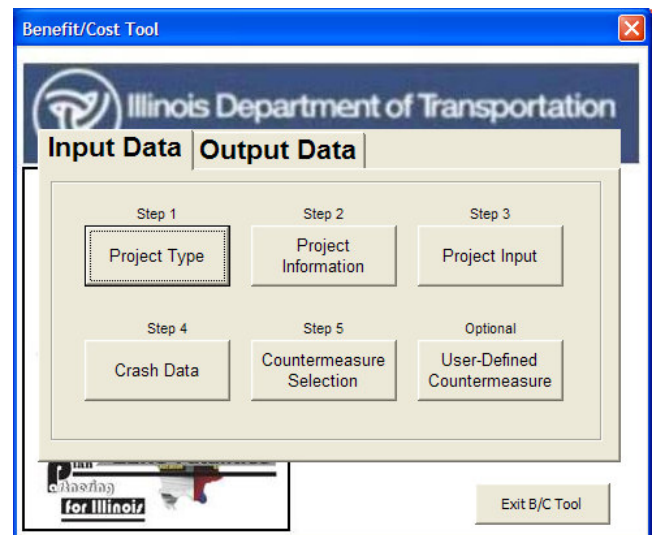
##### *Step-by-Step Procedure*

STEP 1: Start by pressing the **Start B/C Tool** button.



STEP 2: Select the **Input Data** tab.

STEP 3: Select the button labeled **Project Type**.



**Project Type Selection**

Road System  
☒ State ☐ Local

Project Type  
☐ Intersection ☒ Segment

Segments Peer Groups  
☐ PG1 - Rural Two-Lane Highway  
☐ PG2 - Rural Multilane Undivided Highway  
☐ PG3 - Rural Multilane Divided Highway  
☒ PG4 - Rural Freeway, 4 Lanes  
☐ PG5 - Rural Freeway 6+ Lanes  
☐ PG6 - Urban Two-Lane Highway  
☐ PG7 - Urban One-Way Arterial  
☐ PG8 - Urban Multilane Undivided Highway  
☐ PG9 - Urban Multilane Divided Highway  
☐ PG10 - Urban Freeway 4 Lanes  
☐ PG11 - Urban Freeway 6 Lanes  
☐ PG12 - Urban Freeway 8+ Lanes

Return to Main

STEP 4: Select roadway system by clicking on the circle next to **State**. Select **Segment** under Project Type. Select **PG4-Rural Freeway, 4 Lanes** under Intersection Peer Groups.

When complete click on the **Return to Main** button to return to the main input window.

**Benefit/Cost Tool**

Illinois Department of Transportation

Input Data | Output Data

Step 1: Project Type  
 Step 2: Project Information  
 Step 3: Project Input  
 Step 4: Crash Data  
 Step 5: Countermeasure Selection  
 Optional: User-Defined Countermeasure

Exit B/C Tool

STEP 5: On the main menu, select the button labeled **Project Information**.

**Project Information**

Project : Segment Median Improvement - I-80

District: 10 County: Wooded City: Forest

Key Route: Marked Route: I080 MilePost:

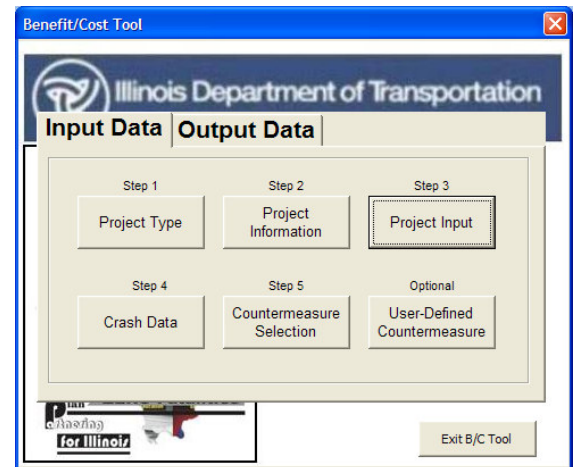
Location : Rural Four Lane Freeway - Interstate 80 in Wooded County

Prepared by : JD Date (mm/dd/yyyy) : 01/20/2011

Return to Main

STEP 6: Complete the information in the boxes as shown. When all fields have been completed, click on **Return to Main**.

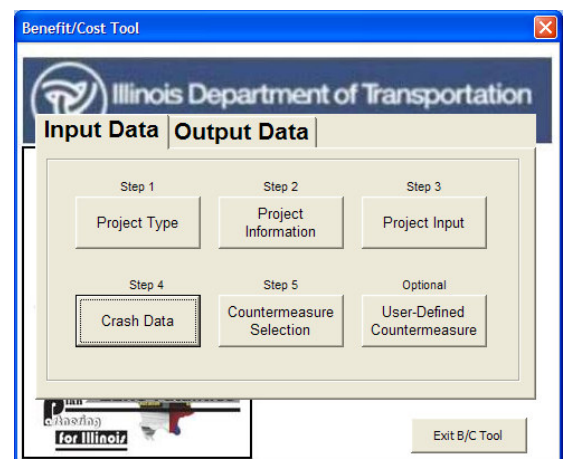
STEP 7: Select the button labeled **Project Input**.



STEP 8: Input the information requested in the fields of the **Segment Input** window. When complete with all fields click on **Return to Main**.

The screenshot shows the 'Segment Input' window. It contains several input fields: 'Crash Data : From 2004 to 2008', 'Current AADT : 18000', 'Length (Miles) : 10', 'Traffic Growth: 1.25' (with a note 'Specify a value between 1 to 5%'), and 'Discount rate: 3.00'. Each field has a corresponding input box or spinner. At the bottom right, there is a 'Return to Main' button.

STEP 9: Select the button labeled **Crash Data**.



STEP 11: Enter all crash data in the ALL CRASHES table and then enter wet pavement crash data in the WET PAVEMENT table. The ALL NON WP/NGT CRASHES table shows the difference between all crashes and wet pavement crashes. If a transcription error occurs during this process, a warning message will pop up notifying the user that wet pavement crashes exceed total crashes. When complete, select the **Return to Main** button.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
1	<b>SEGMENT CRASH SEVERITY DISTRIBUTION BY CRASH TYPE FOR ANALYSIS PERIOD - ALL CRASHES</b>																	
2		Angle	Animal	Fixed Object	Head On	Left Turn	Other Noncollision	Other Object	Overturned	Pedestrian	Pedalcyclist	Parked Vehicle	Rear End	Right Turn	Sideways Same Direction	Sideways Opposite Direction	Turning	Train
3		AG	AN	FO	HO	LT	OtherNC	OtherO	OVT	PD	PDC	PXV	RE	RT	SSD	SOD	T	TR
4	Fatal Crashes			2					1									
5	A-Injury Crashes		1	3					4						1			
6	B-Injury Crashes			4					5									
7	C-Injury Crashes																	
8	PDO Crashes																	
9																		
10																		
11																		
12																		
13	<b>SEGMENT CRASH SEVERITY DISTRIBUTION BY CRASH TYPE FOR ANALYSIS PERIOD - WET PAVEMENT</b>																	
14		Angle	Animal	Fixed Object	Head On	Left Turn	Other Noncollision	Other Object	Overturned	Pedestrian	Pedalcyclist	Parked Vehicle	Rear End	Right Turn	Sideways Same Direction	Sideways Opposite Direction	Turning	Train
15		AG	AN	FO	HO	LT	OtherNC	OtherO	OVT	PD	PDC	PXV	RE	RT	SSD	SOD	T	TR
16	Fatal Crashes			1					2									
17	A-Injury Crashes			1					2									
18	B-Injury Crashes			1					1									
19	C-Injury Crashes																	
20	PDO Crashes																	
21																		
22																		
23																		
24	<b>SEGMENT CRASH SEVERITY DISTRIBUTION BY CRASH TYPE FOR ANALYSIS PERIOD - ALL NON WP/NGT CRASHES</b>																	
25		Angle	Animal	Fixed Object	Head On	Left Turn	Other Noncollision	Other Object	Overturned	Pedestrian	Pedalcyclist	Parked Vehicle	Rear End	Right Turn	Sideways Same Direction	Sideways Opposite Direction	Turning	Train
26		AG	AN	FO	HO	LT	OtherNC	OtherO	OVT	PD	PDC	PXV	RE	RT	SSD	SOD	T	TR
27	Fatal Crashes	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0
28	A-Injury Crashes	0	1	0	2	0	0	0	2	0	0	0	0	0	2	0	0	0
29	B-Injury Crashes	0	0	0	3	0	0	0	4	0	0	0	1	0	1	0	0	0
30	C-Injury Crashes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31	PDO Crashes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32																		
33																		
34																		
35	<b>STEP - 1</b> Input crash data for the analysis period based on crash severity by crash type in the highlighted cells																	
36																		
37																		
38																		
39																		
40																		
41																		
42																		
43																		
44																		
45																		
46																		
47																		

STEP 12: Select the button labeled **Countermeasure Selection**.

Benefit/Cost Tool
✕

**Illinois Department of Transportation**

Input Data
Output Data

Step 1

Project Type

Step 2

Project Information

Step 3

Project Input

Step 4

Crash Data

Step 5

**Countermeasure Selection**

Optional

User-Defined Countermeasure

Exit B/C Tool

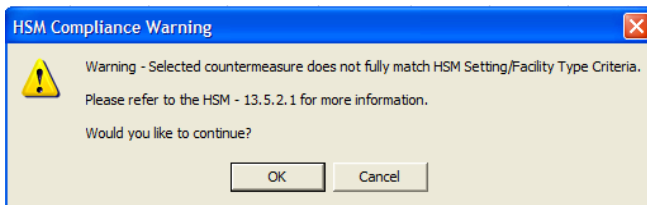


STEP 13: Select the following countermeasures: 2.2.3.S4.1 Install Cable Median Barrier, 2.7.3.S4.1 Flatten Sideslopes (Existing = 1V:3H, Future = 1V:6H), and 2.1.7.AL.1 De-Slick.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
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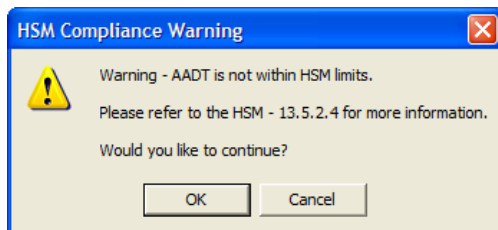
STEP 14: Enter the **Unit Cost** and **Quantity** for the selected countermeasures. When complete, select **Return to Main**.

After selecting **Return to Main**, the following warning messages appear. These warning

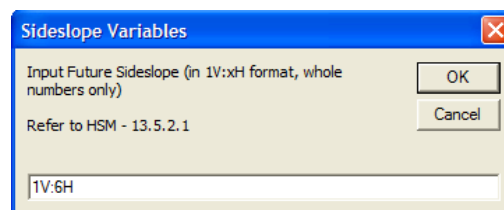
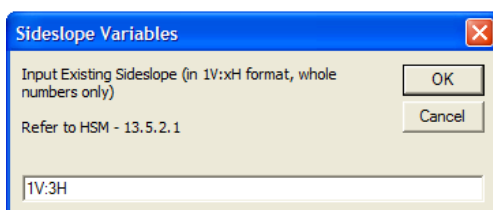


messages will inform the user that the selected countermeasures do not fully meet the setting/facility type and AADT requirements outlines in the HSM. The user has the ability to continue with the selected countermeasure or develop a

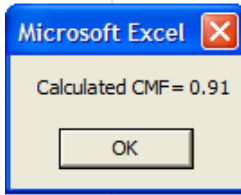
user-defined countermeasure based on more current or applicable research. Otherwise, select **OK** for both warnings.



After selecting 2.7.3.S4.1 Flatten sideslopes the following windows appear. Enter the existing and proposed future sideslopes accordingly. Select **OK** to move on to the next window.

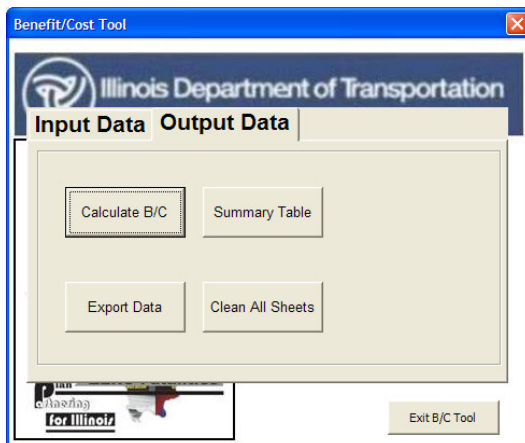
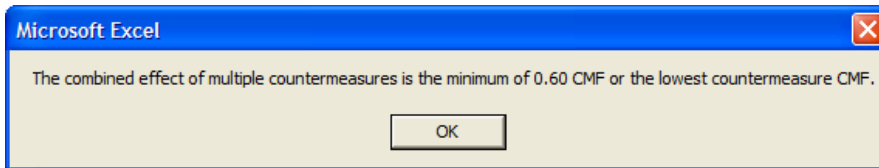






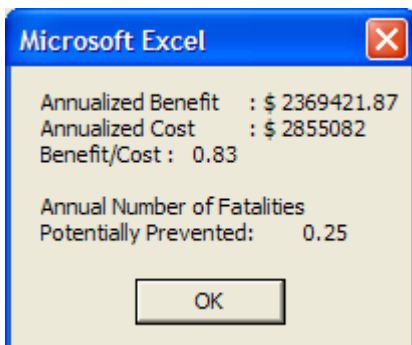
After the existing and proposed future sideslopes are input, the tool will return the appropriate CMF based on HSM methodology. Select **OK** to continue.

A final warning message will appear. For this example, the combined effect of multiple countermeasures only effects wet pavement crashes. Since the wet pavement CMF is equal to 0.43, the other two selected countermeasures will not modify wet pavement crashes. For non-wet pavement crashes, the tool will provide a blended CMF of 0.65 ( $CMF = 0.71 \times 0.91$ ) for the other two selected countermeasures. Select **OK**.



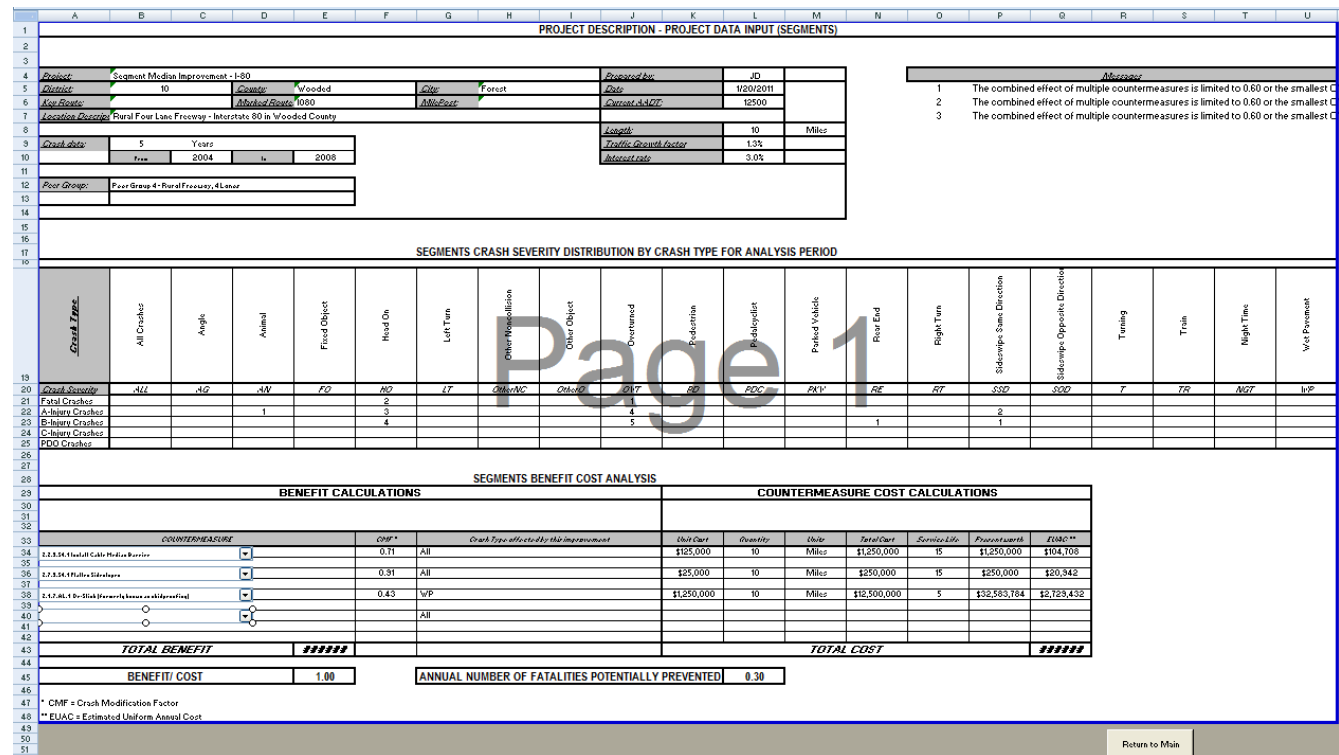
When all input data has been completed, select the **Output Data** tab on the main menu and the screen shown below will appear.

STEP 15: Click on the **Calculate B/C** button to obtain the benefit-cost ratio.



The image to the left will appear with the benefit-cost ratio for this project. Click the **OK** button to return to the main menu.

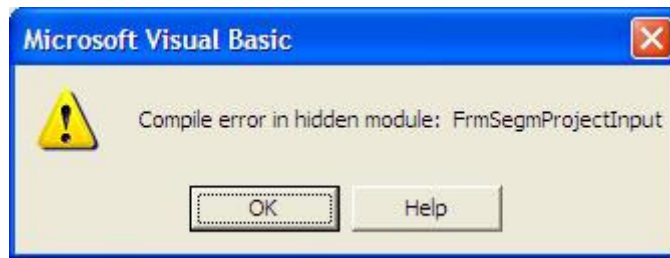
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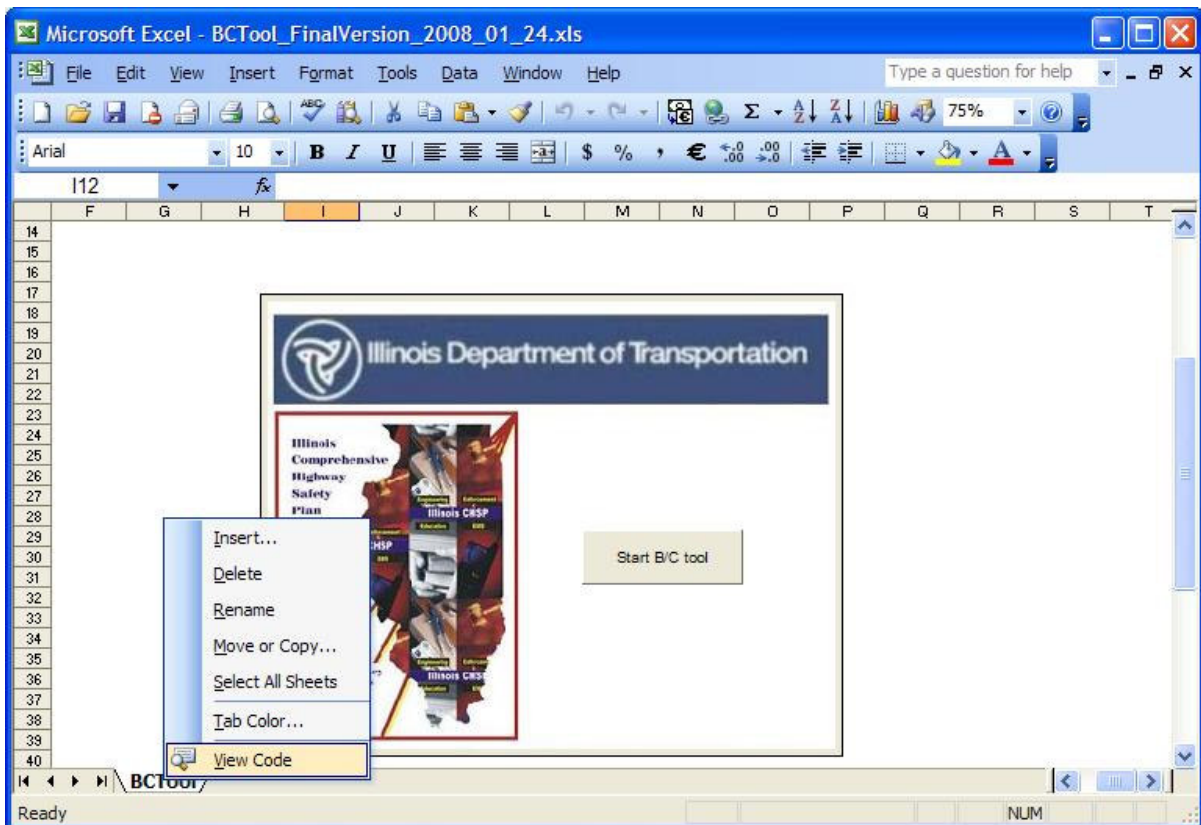
Notice the warning messages in the upper right hand corner. These messages appear because multiple countermeasures were selected.

## Troubleshooting Office 2003

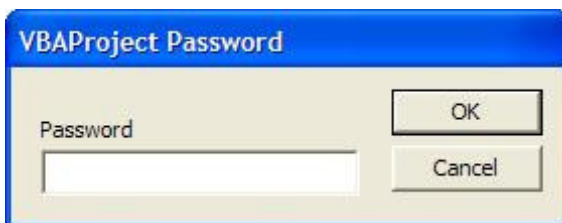
I am getting the error message shown below. How can I fix it?



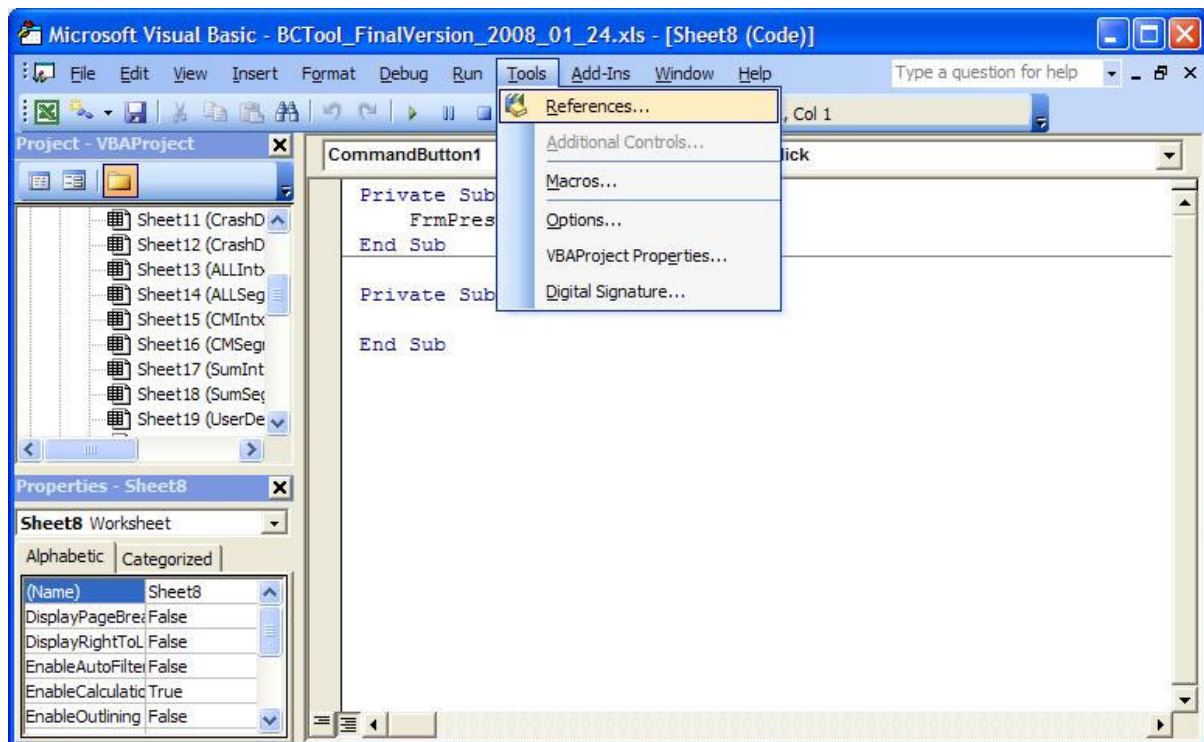
The first step to fix this error is to open the Visual Basic code. Right click on the BCTOOL tab located on the bottom left of the window. Select View Code from the pop up menu



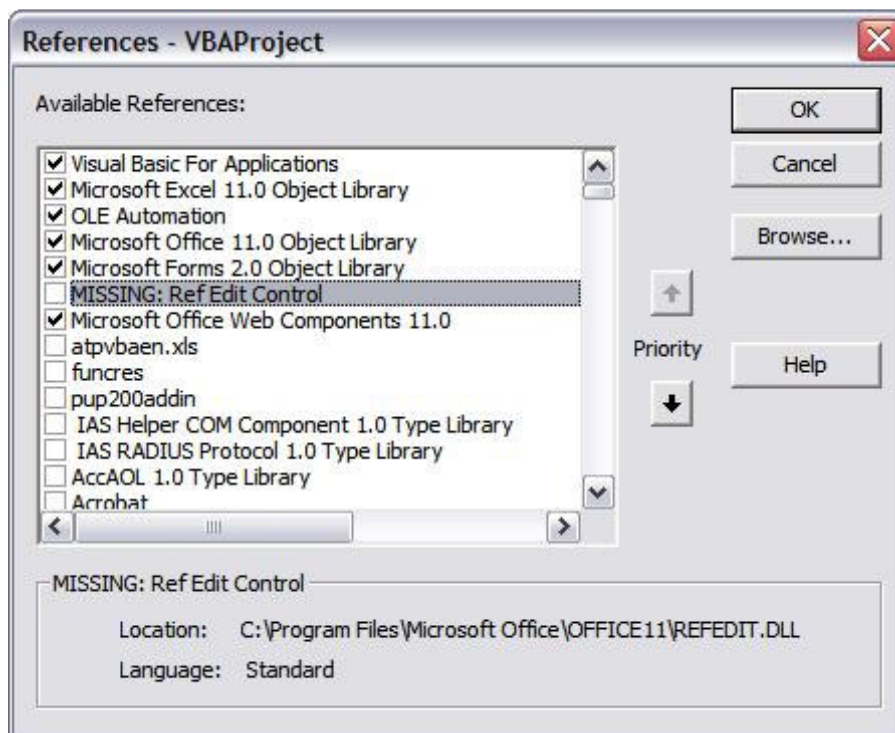
Since the tool is password protected, it is required to input the password (IDOTsafety) in the box shown below. Hit OK to continue.



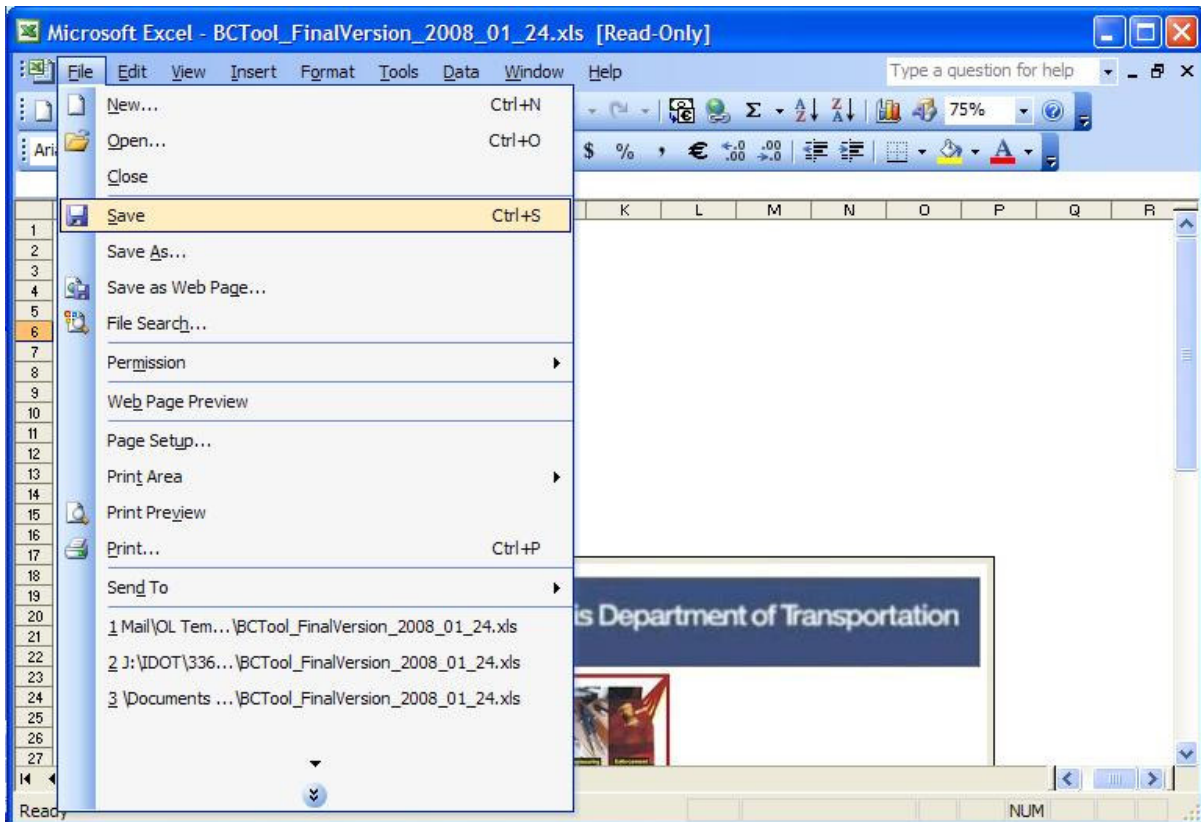
Select Tools – References from the top Microsoft Visual Basic toolbar



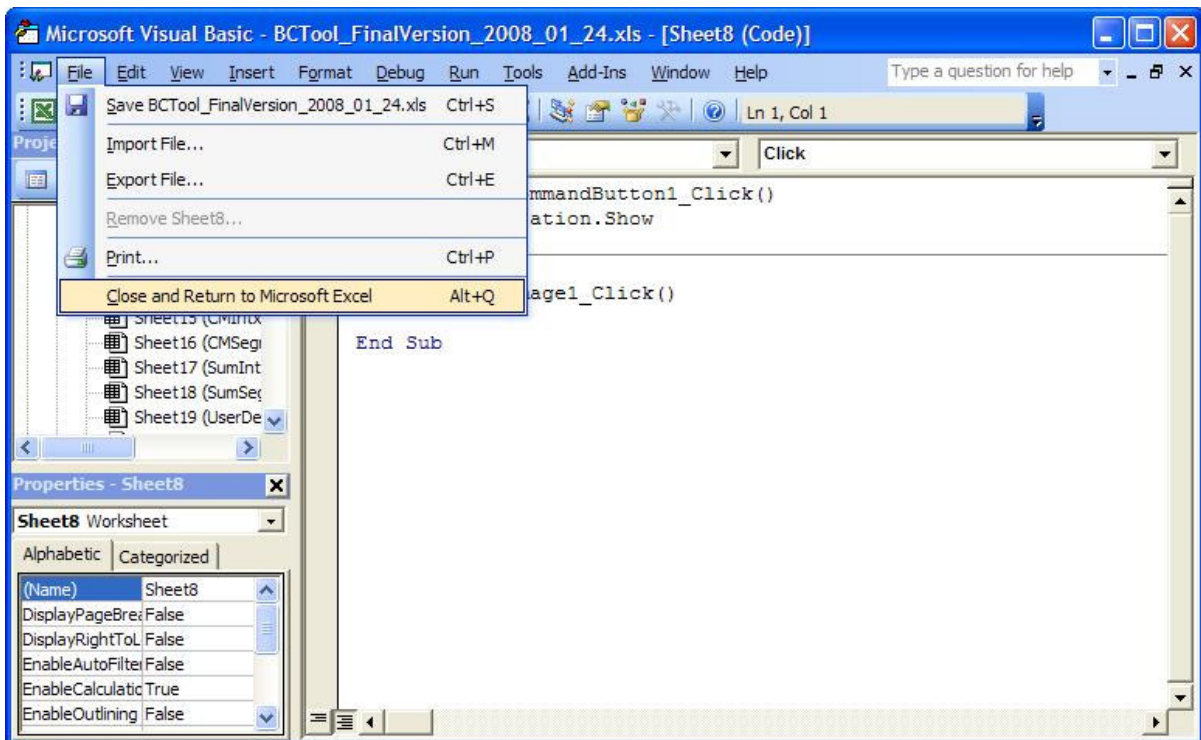
Look for the reference "Missing Ref Edit Control" and unchecked the box. Hit OK to continue.



Go back to the Microsoft Excel window, and select File-Save from the top toolbar

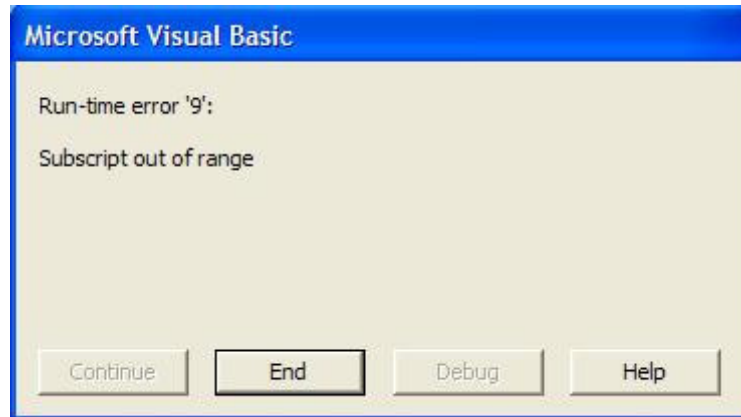


Once the file is saved, go back to the Visual Basic window, and select File - Close and Return to Microsoft Excel. Now you can start using the Benefit Cost Tool.

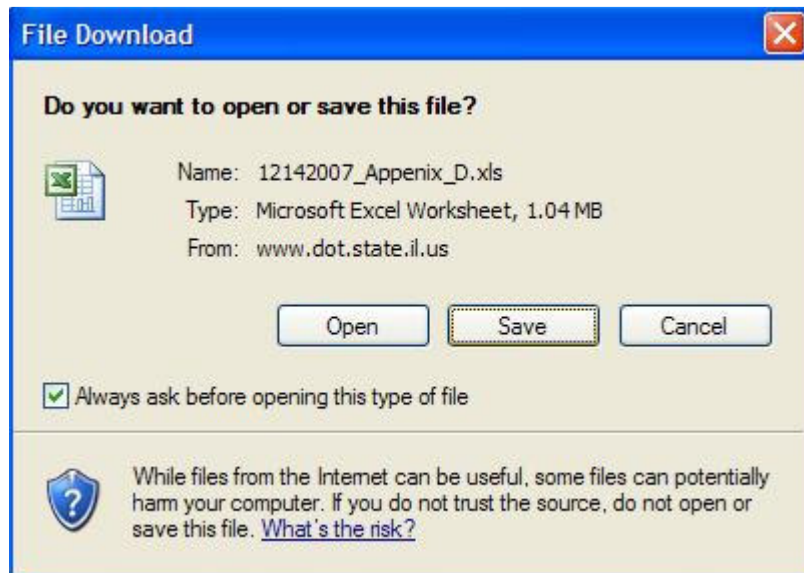




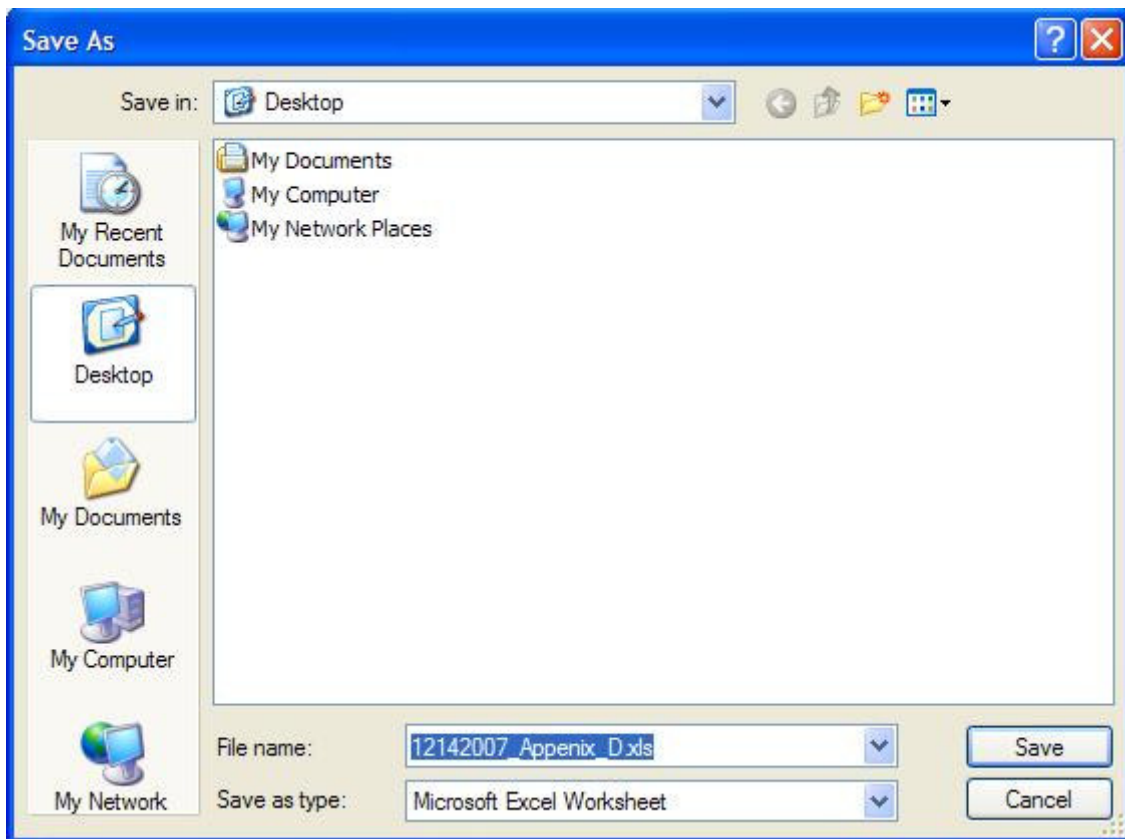
I open the file from IDOT website, and tried to run the tool, but I am getting the error shown below. How can I fix it?



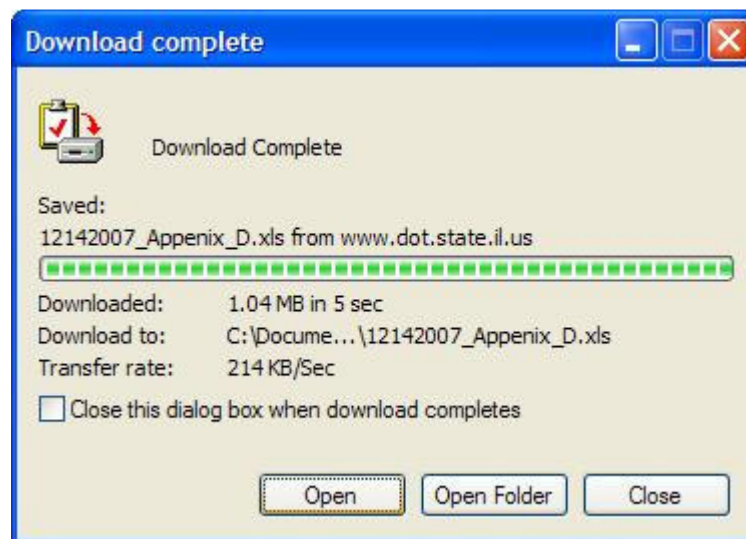
The tool will not work without downloading it and saving it into the computer prior its use. Try downloading the tool, and clicking the Save button



Select the desire location and an appropriate name to save the tool and click Save



After the download is completed, click Open, and the tool is ready to use.



**When I open the tool I clicked on Disable Macros, and I cannot have the tool to work. Is there a way of changing this setting?**

Yes. Close the tool without saving changes and try to reopen it again. This time make sure to click Enable Macros. This will solve the problem.



**I accidentally saved the tool with the input data for my project inside. Is there a way to obtain the original tool without all the changes I made?**

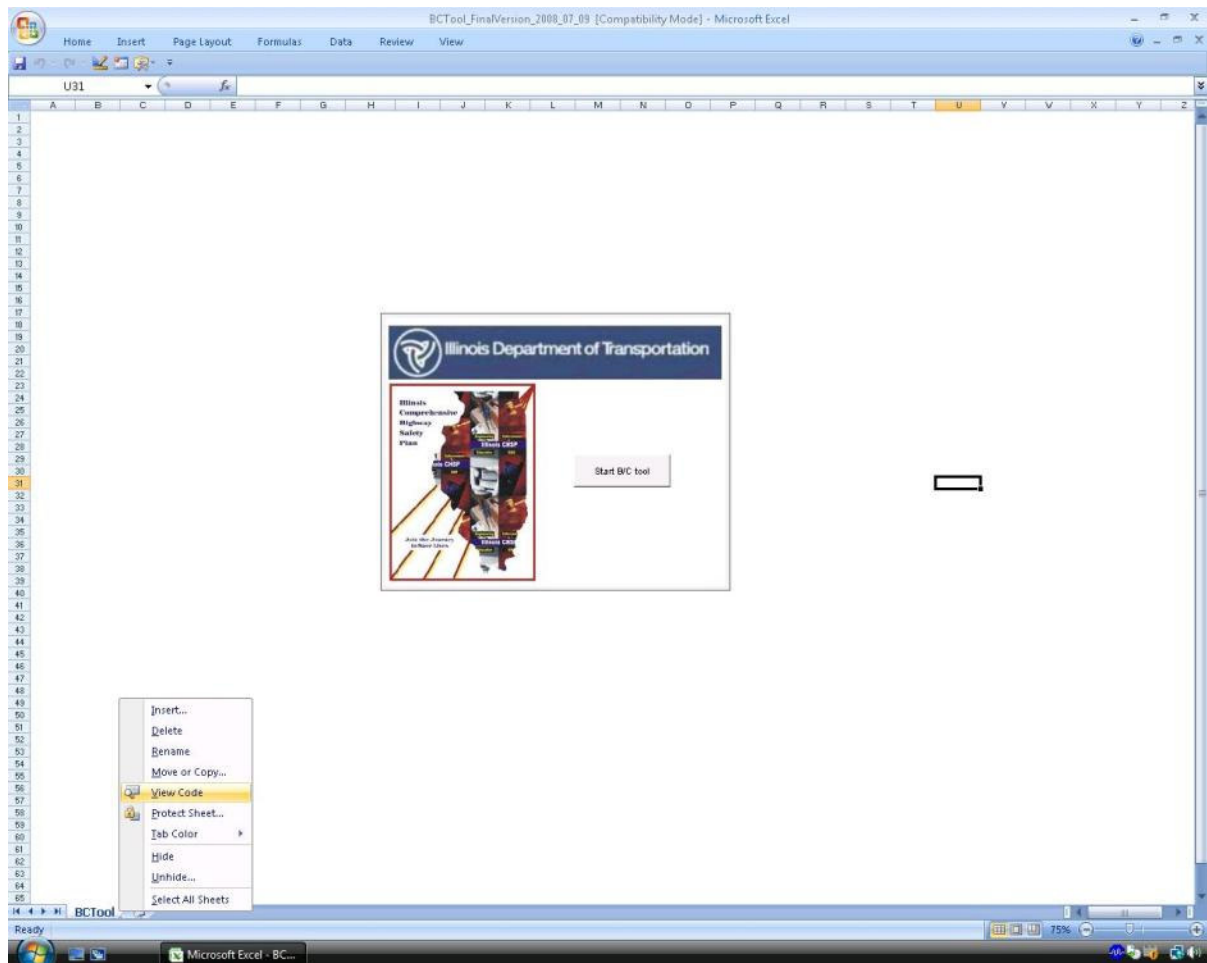
Yes. Go back to IDOT website (<http://www.dot.state.il.us/illinoisCHSP/hsip.html>) and download and save the tool again in your computer. If you want to save the information you input for a specific project, try using the option export data included in the tool under Output data

## Troubleshooting Office 2007

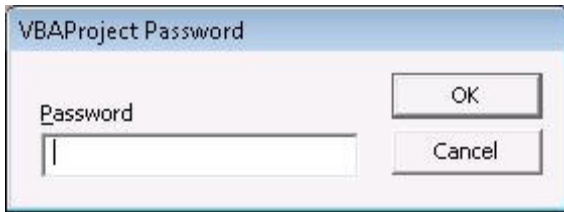
I am getting the error message shown below. How can I fix it?



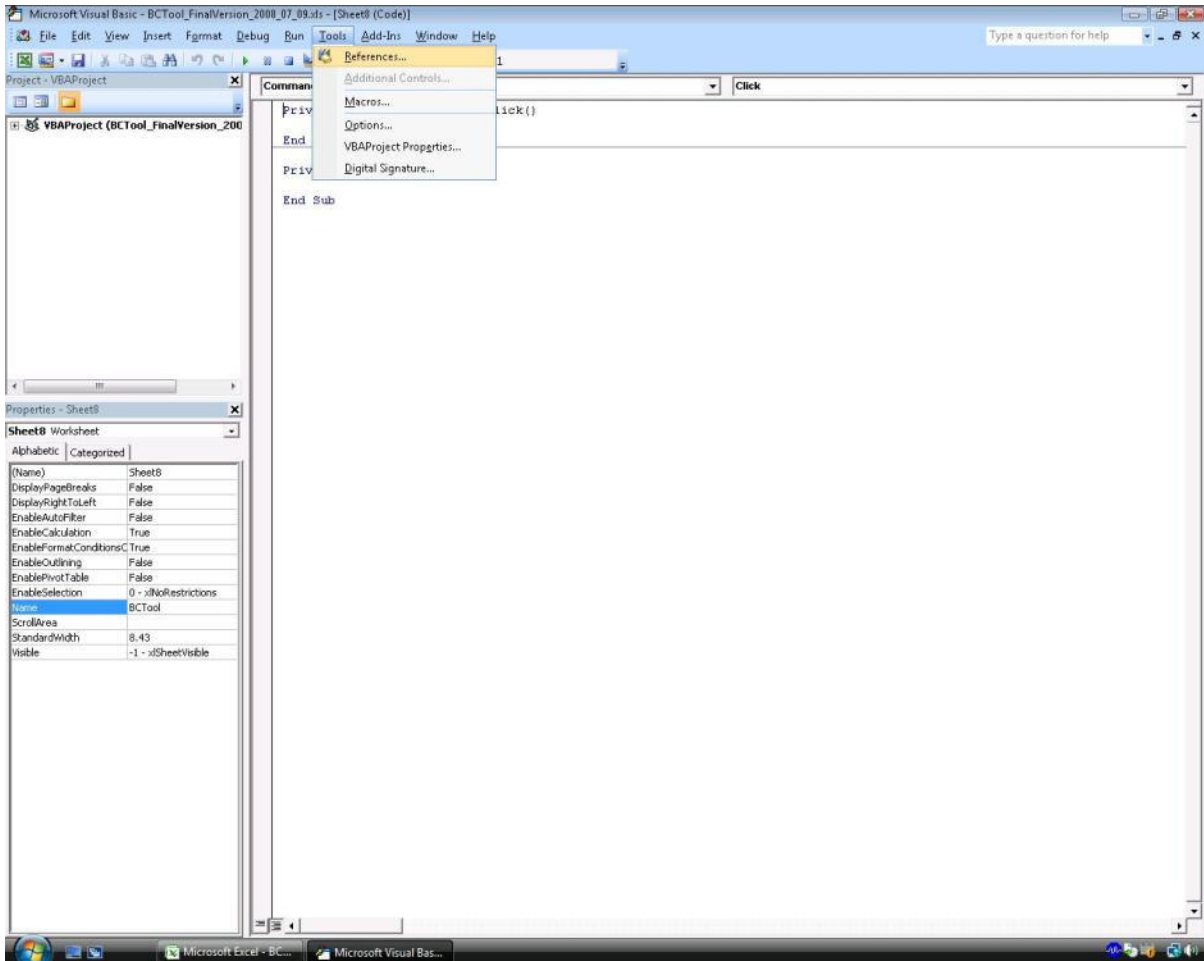
The first step to fix this error is to open the Visual Basic code. Close everything, and reopen the Benefit-Cost Tool. Right click on the BCTOOL tab located on the bottom left of the window. Select View Code from the pop up menu



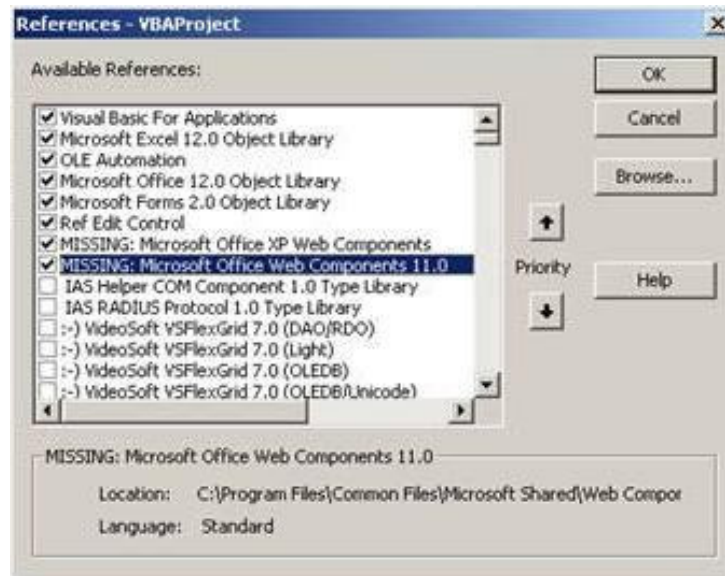
Since the tool is password protected, it is required to input the password (IDOTsafety) in the box shown below. Hit OK to continue. There are some files that are not protected, if you do not see the pop-up window shown below, ignore this step.



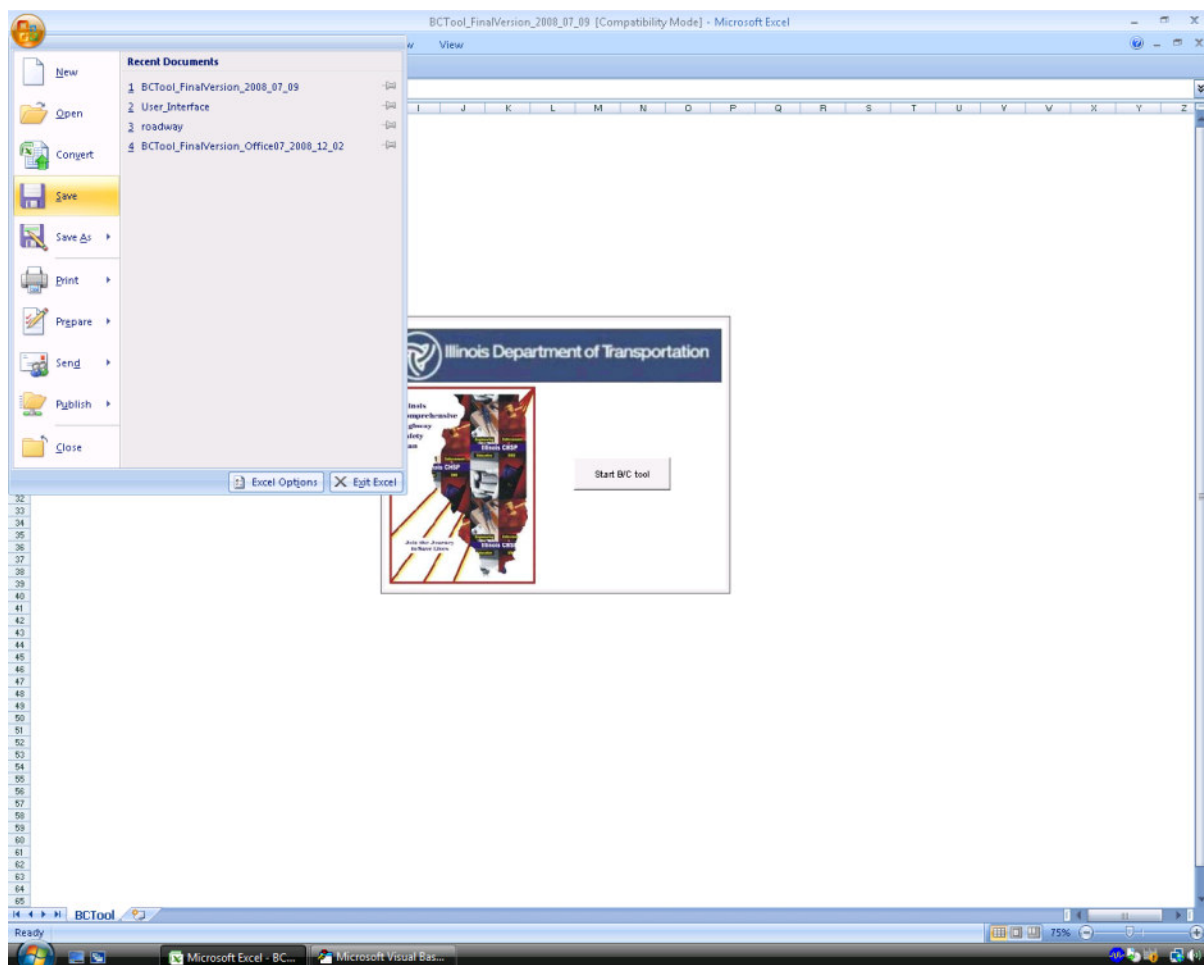
Select Tools – References from the top Microsoft Visual Basic toolbar



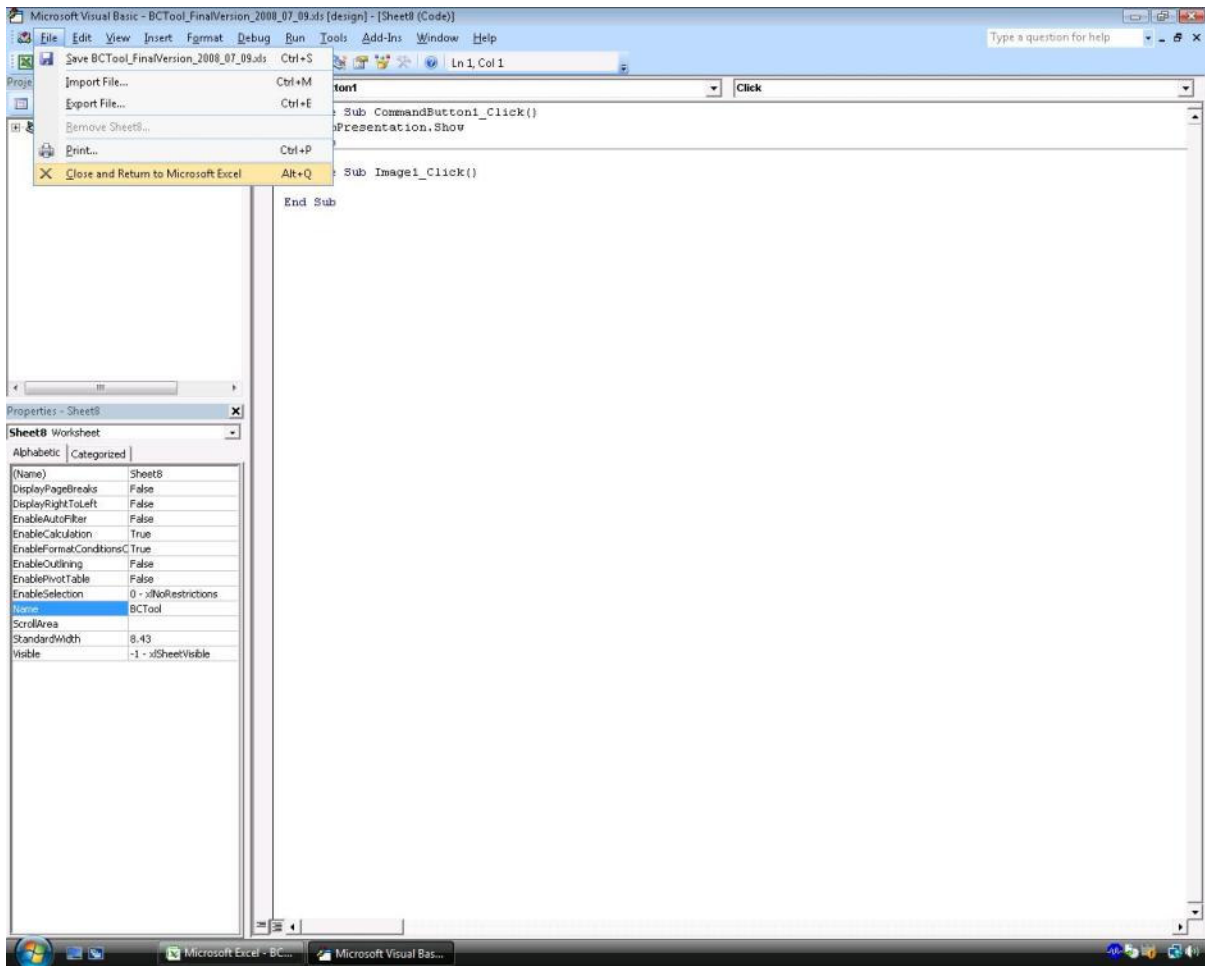
Look for the references “MISSING: Microsoft Office XP Web Components”, and “MISSING: Microsoft Office Web components 11.0” and unchecked the boxes. Hit OK to continue.



Go back to the Microsoft Excel window, and select the Office button-Save from the top left corner



Once the file is saved, go back to the Visual Basic window, and select File - Close and Return to Microsoft Excel. Now you can start using the Benefit Cost Tool.



## Appendix A – Countermeasure References and Methodology

A crash modification factor (CMF) is used to estimate the change in crashes as a result of implementing a specific safety improvement countermeasure(s). With the release of the HSM and the rollout of the FHWA CMF Clearinghouse website, CMF's are better defined in terms of application and applicability. The BC Tool includes CMFs from a variety of sources. Most CMFs were obtained from the *Highway Safety Manual 1st Edition (AASHTO 2010)*. CMFs not included in the HSM were obtained from the FHWA CMF Clearinghouse website, <http://www.cmfclearinghouse.org>, or in a few cases, historic IDOT CMF values were used.

The BC Tool currently includes 67 treatments for intersections and 96 treatments for segments. Many treatments have multiple CMFs due to varying characteristics of different facility types. The following sections describe how CMF were used from each of the sources listed above.

### HSM CMF Methodology

The HSM provides detailed information for each safety countermeasure listed in Part D. The HSM has screened all published CMFs, based on statistically methods to determine whether or not they are sufficiently reliable and stable to be presented in the HSM. As a result of this process, only select countermeasures were included in the manual. The application of the published CMFs associated with each countermeasure may have restrictive setting and facility types (i.e. rural two-lane highway), limiting AADT acceptability ranges, and varying crash type/severity applicability. Unfortunately, the HSM is not consistent between countermeasures. To account for this inconsistency, CMFs included in the BC Tool were selected based on the following logic for each of the following situations:

#### Crash Type/Severity Type

The HSM provides CMFs based on the following crash type and severity type distributions:

##### *Crash Types:*

- Specific (i.e. Single Vehicle Run off Road, Nighttime, Rear End, etc.)
- All Types
- Unspecified

##### *Severity Types*

- Fatal
- Injury (Includes Fatal)
- Non-Injury
- All Severities
- Unspecified

For the purpose of the BC Tool, injury severity crash types were always chosen over all severity types since the tool is developed to assess countermeasure benefits that target fatal, Injury Type A, and Injury Type B crashes. Furthermore, specific crash type information is more useful compared to all crash types since it applies the CMF to only to applicable crash

types. Adhering to this logic, the following combination of crash type/injury severity was chosen for inclusion into the BC Tool (in order of preference).

1. Specific Crash Type/Injury Severity
2. All Crash Types/Injury Severity
3. Specific Crash Type/ All Severities
4. All Crash Types/ All Severities

It was assumed if crash type/severity type was listed as unspecified; it would fall under the “all crash type” or “all severity” category.

For example, the HSM Section 13.9.2.1 provides CMF for Continuous Shoulder Rumble Strips for rural, multilane highways (IDOT Peer Group 3). Table A1 shows the provided information from the HSM Table 13-44.

**TABLE A1**  
Shoulder Milled Rumble Strips Crash Modification Factors from HSM 13.9.2.1

Treatment	Setting (Road Type)	Traffic Volume (AADT)	Crash Type (Severity)	CMF	Std. Error
Install continuous milled-in shoulder rumble strips	Rural (Multi-lane divided)	2,000 to 50,000	All types (All severities)	0.84	0.1
			All types (injury)	0.83	0.2
			SVROR (All severities)	0.90	0.3
			SVROR (Injury)	0.78	0.3

Base Condition: Absence of shoulder rumble strips.

Based on the logic provided above, the SVROR (Injury) CMF of 0.78 is included in the BC Tool, although four different CMFs are provided in the HSM. The SVROR type CMF would only be applied to fixed object and overturned type crashes. If, for instance the end user would want to use a more generic CMF, such as the one for “All Types (Injury)”, they have the ability to create a user defined CMFs. This approach is appropriate when the end user does not have specific crash type data, but would still like to apply this type treatment. It is highly recommended that the user always reference the latest version of the HSM prior to using other CMF resources.

### Setting/Facility Type

The HSM provides information regarding the applicability of each CMF to different setting (urban, rural) or facility (two-lane, undivided, divided, etc.) types. The combination of the setting and facility type can directly be correlated with IDOT Peer Group designations. In many situations, the published countermeasure Setting/Facility Type in the HSM is specific and limiting. The BC Tool countermeasures typically adhered to the Setting/Facility type provided in the HSM; however, in several circumstances, a CMF was applied to a different Setting/Facility Type. When a specific setting/facility type was not listed in the HSM for a given countermeasure, the values provided in the HSM were carried over to other setting/facility types. Table A2 shows the 12 different countermeasures where the CMF was



applied to a different setting/facility type that was published in the HSM. Table A2 shows the countermeasure, the applicable HSM section, the published setting/facility type, and the proposed setting/facility type(s) for inclusion in the tool.

**TABLE A2**  
HSM Countermeasures Applied to Unlisted Setting/Facility Types

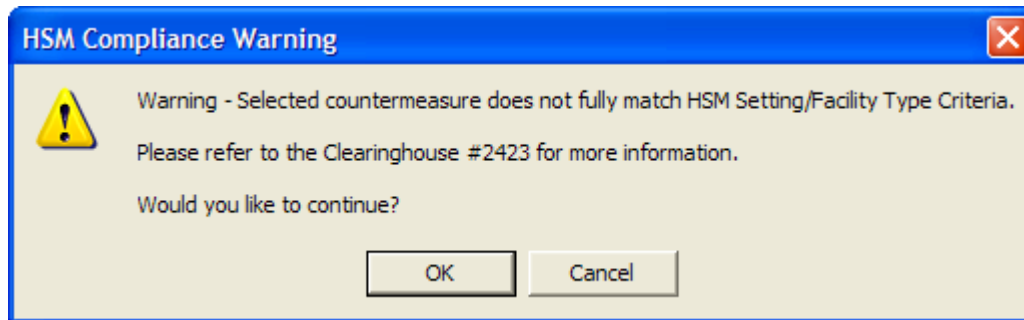
Countermeasure	HSM Section	HSM setting/facility type(s)	Also applied to setting/facility type(s)
Add Left Turn Lane (Three-Leg Intersection)	14.6.2.2	Rural Minor Stop, Rural Signal, Urban Minor Stop, Urban Signal	Rural All Stop, Urban All Stop
Add Left Turn Lane (Four-Leg Intersection)	14.6.2.3	Rural Minor Stop, Rural Signal, Urban Minor Stop, Urban Signal	Rural All Stop, Urban All Stop
Install Traffic Signals	14.4.2.6	Rural Minor Stop, Urban Minor Stop	Rural All Stop, Urban All Stop
Shoulder Rumble Strips	13.9.2.1 (Clearinghouse #2423) <sup>1</sup>	Rural Two-Lane, Rural Multi-Divided, Urban/Rural Freeways	Rural Multi-Undivided <sup>2</sup>
Install TWLTL	16.5.2.1	Rural Two-Lane	Rural Multi-Undivided, Urban Two-Lane, Urban Multi-Undivided
Median Barrier	13.5.2.4	Rural Multi-Divided	All Urban/Rural Divided Facilities
Steel Median Barrier	13.5.2.4	Rural Multi-Divided	All Urban/Rural Divided Facilities
Cable Median Barrier	13.5.2.4	Rural Multi-Divided	All Urban/Rural Divided Facilities
Flatten Sideslopes	13.5.2.1	Rural Two-Lane, Rural Multi-Undivided	All Other Urban/Rural Settings.
Raised Reflective Markers (Undivided Facility CMF)	13.8.2.7	Rural Two-Lane	Rural Multi-Undivided, Urban Two-Lane, Urban Multi-Undivided
Raised Reflective Markers (Divided Facility CMF)	13.8.2.7	Rural 4 Lane Freeway	All Urban/Rural Freeways
Convert Angle to Parallel Parking	13.11.2.4	Urban Two-Lane, Urban Multi-Divided, Urban Multi-Undivided	Urban One-Way

<sup>1</sup>Used FHWA CMF Clearinghouse for Rural Two-Lane Shoulder Rumble Strips.

<sup>2</sup>Did not apply to urban two-way, urban multi-undivided, or urban multi-divided facilities.

Within the tool, if a user does select one of the countermeasures listed in Table 2, a warning message would notify the user that the countermeasure does not fully meet the applicability requirements outlined in the HSM. The user then has the ability to continue using the

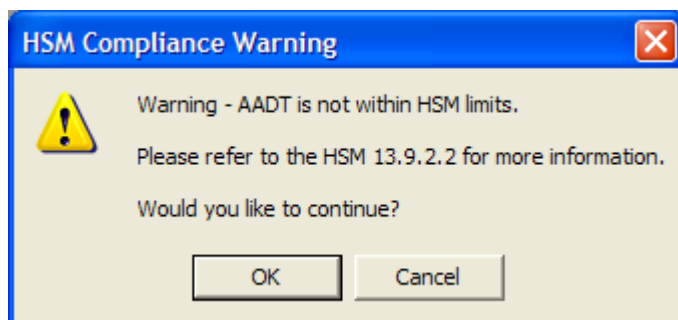
selected countermeasure, or cancel and either create a user defined countermeasure or select a different countermeasure. The image below shows a typical warning message.



If the user does select a countermeasure that does not fully match HSM Setting/Facility type criteria, this warning message will also be saved to the project summary report. At the time of the latest

### AADT Ranges

Several countermeasures listed in the HSM and FHWA CMF clearinghouse have traffic volume AADT thresholds. The BC tool includes checks to determine if a study segment/intersection AADT is within the AADT limits defined for each countermeasure. Similar to the Setting/Facility type, a warning message would be presented if the AADT is outside the allowable limits and will be shown on the analysis summary sheet. It would not preclude the user from using the selected countermeasure, although the user can choose another countermeasure if desired. The image below shows an AADT warning message and direction to the countermeasure reference for more information.



### FHWA CMF Clearinghouse Methodology

For countermeasures not included in the HSM but were identified to be included in the BC tool, the FHWA CMF Clearinghouse was the primary CMF source for those countermeasures. It was used to update and supplement CMF values not included in the HSM. The FHWA CMF Clearinghouse is a regularly updated, online repository of CMFs. Each CMF listed in the clearinghouse is given a star quality rating, assessing the quality or confidence in the results of the study producing the CMF. The star rating is based on a scale (1 to 5), with five indicating the best rating. For the purpose of the BC Tool a three star or better rating was generally regarded as acceptable.

A total of 17 CMFs used values from the FHWA CMF clearinghouse in the BC tool. All countermeasures used CMFs that had a three star or greater rating with the following two exceptions:

- Separation between Pedestrians/Traffic
- Install Advance Signal Warning Signs

### Historic IDOT CMFs

The remaining CMFs were determined based on historic IDOT CRM values. They were only used when better information was not provided in either the HSM or the FHWA CMF clearinghouse.

### Integration of CMFs into the BC Tool

The latest version of the BC Tool provides internal sorting functionality that only allows the user to select a countermeasure that is appropriate for the selected IDOT peer group. The following bullets describe how users will select countermeasures and also provide information regarding countermeasures that may require additional information.

- The user will select an IDOT Peer Group as part of the project type section in the tool. Upon selecting a specific project peer group, the tool will automatically filter the countermeasure list so only the appropriate countermeasures are available for selection. Exhibit 3 shows the Project Type Selection dialog box.

EXHIBIT 3

**Project Type Selection**

Project Type

☐ Intersection ☒ Segment

Segments Peer Groups

☐ PG1 - Rural Two-Lane Highway

☒ PG2 - Rural Multilane Undivided Highway

☐ PG3 - Rural Multilane Divided Highway

☐ PG4 - Rural Freeway, 4 Lanes

☐ PG5 - Rural Freeway 6+ Lanes

☐ PG6 - Urban Two-Lane Highway

☐ PG7 - Urban One-Way Arterial

☐ PG8 - Urban Multilane Undivided Highway

☐ PG9 - Urban Multilane Divided Highway

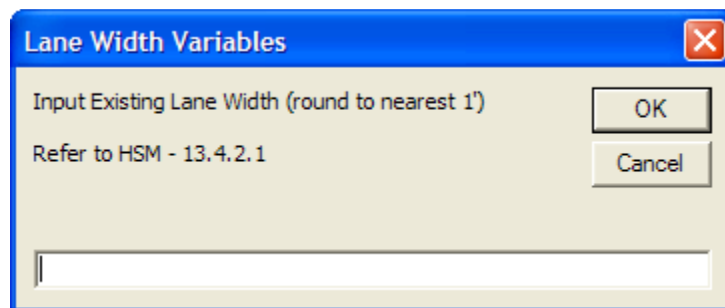
☐ PG10 - Urban Freeway 4 Lanes

☐ PG11 - Urban Freeway 6 Lanes

☐ PG12 - Urban Freeway 8+ Lanes

Return to Main

- The user will have the ability to select up to four different countermeasures. Based on HSM methodology, several countermeasures now are functions of other variables (i.e. lane width) or require a value to be read from a table. Upon selection of a countermeasure that requires additional information, the user will be prompted for the pertinent information through a series of input boxes. These input boxes will also provide the user with a source to obtain additional information regarding the selected countermeasure. After the user provides any additional required information, a message box will tell the user the calculated CMF for the given countermeasure. An example of this sequence for modifying lane width is shown below.



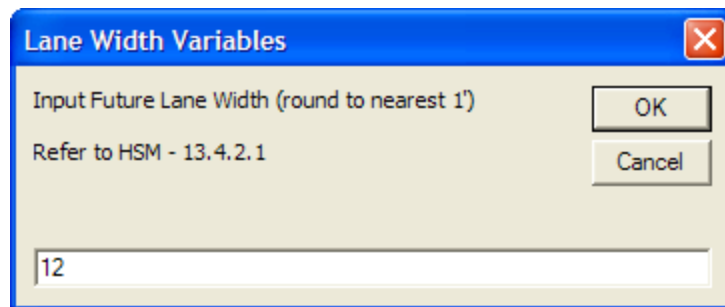
Lane Width Variables

Input Existing Lane Width (round to nearest 1')

Refer to HSM - 13.4.2.1

OK

Cancel



Lane Width Variables

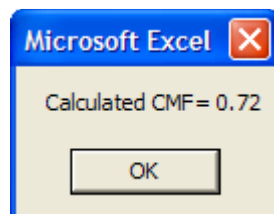
Input Future Lane Width (round to nearest 1')

Refer to HSM - 13.4.2.1

OK

Cancel

12



Microsoft Excel

Calculated CMF= 0.72

OK

Table A3 lists the countermeasures that require additional user-defined inputs, the HSM reference section, the specific additional data required, and comments that provide more clarification regarding each countermeasure. Table A4 shows the comprehensive countermeasures included in the benefit cost tool. Additional information for each countermeasure is also provided including: service life, CMF, crash type affected, setting/facility type, and CMF source.

**TABLE A3**  
HSM Countermeasures Requiring Additional User Inputs

Countermeasure	HSM Section	Additional Data Needed	Notes
Reduce Intersection Skew Angle	14.6.2.1	Existing Skew Angle, Future Skew Angle	Reference HSM Figure 14-5
Modify Lane Width	13.4.2.1	Existing Lane Width, Future Lane Width	Round to nearest foot across all lanes.
Add or Widen Paved Shoulder	13.4.2.4	Existing Shoulder Width, Future Shoulder Width	
Modify Shoulder Type	13.4.2.5	Existing Shoulder Width, Existing Shoulder Type, Future Shoulder Type	Applicable Shoulder Types Include Paved, Gravel, Composite, and Turf. For Shoulder Widths >10 feet, use 10 feet.
Provide TWLTL	16.5.2.1	Driveway Density (dwy/mi), Proportion of Driveway Related Crashes (in decimal)	
Change Width of Existing Median	13.4.2.7	Existing Median Width, Future Median Width	
Improve Superelevation Variance	13.6.2.2	Existing Variance, Future Variance	Superelevation variance is the difference between recommended design value and existing superelevation.
Modify Horizontal Curve Radius	13.6.2.1	Length of Curve (mi), Radius of Curvature (feet)	
Flatten Sideslopes	13.5.2.1	Existing Sideslope (in 1V:xxH), Future Sideslope (in 1V:xxH)	Sideslopes can only be the following values: Existing (2H, 3H, 4H, 5H or 6H) Future (4H, 5H, 6H, or 7H)
Increase Distance to Roadside Features	13.5.2.2	Existing Distance to Roadside Features (ft), Future Distance to Roadside Features (ft)	
Reduce Roadside Hazard Rating	13.5.2.6	Existing Rating, Future Rating	Ratings can be found in Table 13-25 in the HSM.
Modify Access Point Density	13.14.2.1	Existing Density (dwy/mi), Future Density (dwy/mi)	
Modify Work Zone Duration	16.4.2.1	Existing Duration (days), Proposed Duration (days)	
Modify Work Zone Length	16.4.2.1	Existing Length (mi) Proposed Length (mi)	

TABLE A4  
IDOT Benefit-Cost Analysis Tool Countermeasures List

COUNTERMEASURES	Unit	Service Life	CMF	Crash Type Affected by Countermeasures	Setting Type	Facility Type	Source <sup>1</sup>
<u>1.0 Intersection Locations</u>							
<u>1.1 General</u>							
1.1.1.I5.1 - General - Convert Four-leg Intersection to Two Three-Leg Intersections	Unit Qnty	15	<sup>2</sup>	All	Urban	Minor Stop	HSM 14.4.2.1
1.1.2.AL.1 - General - Convert Intersection to Grade-separated Interchange (Four Leg Intersection)	Unit Qnty	20	0.43	All	All	All	HSM 15.4.2.1
1.1.2.AL.2 - General - Convert Intersection to Grade-separated Interchange (Three-Leg Intersection)	Unit Qnty	20	0.84	All	All	All	HSM 15.4.2.1
1.1.3.AL.1 - General - Design Interchange with Crossroad Above Freeway	Unit Qnty	20	0.96	All	All	All	HSM 15.4.2.2
1.1.4.AL.1 - General - Modify Speed Change Lane Design (Deceleration Lanes)	Unit Qnty	15	0.93	All	All	All	HSM 15.4.2.3
1.1.5.AL.1 - General - Modify Two-lane-change Merge/Diverge Area to One-Lane Change	Unit Qnty	15	0.68	SSD, RE	All	All	HSM 15.4.2.4
<u>1.2 Pavement</u>							
1.2.1.AL.1 - Pavement - Widening and Resurfacing or Widening alone	Miles	15	0.75	All	All	All	Historic IDOT CMF
1.2.2.AL.1 - Pavement - Resurfacing alone	Miles	10	1.00	No CRF identified	All	All	No Good Data Available
1.2.3.AL.1 - Pavement - De-Slick (formerly known as skidproofing)	Miles	5	0.43	WP	All	All	Clearinghouse #2266
1.2.4.I1.1 - Pavement - Rumble Strips (Transverse)	Unit Qnty	8	0.91	All	Rural	Minor Stop	Clearinghouse #2704
1.2.4.I2.1 - Pavement - Rumble Strips (Transverse)	Unit Qnty	8	0.91	All	Rural	All Stop	Clearinghouse #2704
1.2.5.AL.1 - Pavement - Raised Reflective Marker Median	Miles	15	0.50	HO,SOD,LT,T,RT	All	All	Historic IDOT CMF
1.2.6.AL.1 - Pavement - Thermoplastic or Preformed Tape Median	Miles	3	0.50	RE,HO,SSD,SOD,LT,RT,T	All	All	Historic IDOT CMF
1.2.7.AL.1 - Pavement - Painted Median	Miles	2	0.50	RE,HO,SSD,SOD,LT,RT,T	All	All	Historic IDOT CMF
1.2.8.AL.1 - Pavement - Lane Addition	Unit Qnty	15	0.50	RE,SSD, LT,RT,T	All	All	Historic IDOT CMF
1.2.9.I1.1 - Pavement - Add Left Turn Lane (Three-Leg Intersection)	Unit Qnty	15	0.45	All	Rural	Minor Stop	HSM - 14.6.2.2
1.2.10.I2.1 - Pavement - Add Left Turn Lane (Three-Leg Intersection)	Unit Qnty	15	0.45	All	Rural	All Stop	HSM - 14.6.2.2
1.2.10.I3.1 - Pavement - Add Left Turn Lane (Three-Leg Intersection)	Unit Qnty	15	0.85	All	Rural	Signal	HSM - 14.6.2.2
1.2.10.I5.1 - Pavement - Add Left Turn Lane (Three-Leg Intersection)	Unit Qnty	15	0.65	All	Urban	Minor Stop	HSM - 14.6.2.2
1.2.10.I6.1 - Pavement - Add Left Turn Lane (Three-Leg Intersection)	Unit Qnty	15	0.65	All	Urban	All Stop	HSM - 14.6.2.2
1.2.10.I7.1 - Pavement - Add Left Turn Lane (Three-Leg Intersection)	Unit Qnty	15	0.94	All	Urban	Signal	HSM - 14.6.2.2
1.2.11.I1.1 - Pavement - Add Left Turn Lane (Four-Leg Intersection)	Unit Qnty	15	0.65	All	Rural	Minor Stop	HSM - 14.6.2.3
1.2.11.I2.1 - Pavement - Add Left Turn Lane (Four-Leg Intersection)	Unit Qnty	15	0.65	All	Rural	All Stop	HSM - 14.6.2.3
1.2.11.I3.1 - Pavement - Add Left Turn Lane (Four-Leg Intersection)	Unit Qnty	15	0.82	All	Rural	Signal	HSM - 14.6.2.3
1.2.11.I5.1 - Pavement - Add Left Turn Lane (Four-Leg Intersection)	Unit Qnty	15	0.71	All	Urban	Minor Stop	HSM - 14.6.2.3

TABLE A4  
IDOT Benefit-Cost Analysis Tool Countermeasures List

COUNTERMEASURES	Unit	Service Life	CMF	Crash Type Affected by Countermeasures	Setting Type	Facility Type	Source <sup>1</sup>
1.2.11.I6.1 - Pavement - Add Left Turn Lane (Four-Leg Intersection)	Unit Qnty	15	0.71	All	Urban	All Stop	HSM - 14.6.2.3
1.2.11.I7.1 - Pavement - Add Left Turn Lane (Existing Signalized, Four-Leg Intersection)	Unit Qnty	15	0.91	All	Urban	Signal	HSM - 14.6.2.3
1.2.11.I7.2 - Pavement - Add Left Turn Lane (Newly Signalized, Four-Leg Intersection)	Unit Qnty	15	0.72	All	Urban	Signal	HSM - 14.6.2.3
1.2.12.I1.1 - Pavement - Add Right Turn Lane on One Approach	Unit Qnty	15	0.77	All	Rural	Minor Stop	HSM - 14.6.2.6
1.2.12.I3.1 - Pavement - Add Right Turn Lane on One Approach	Unit Qnty	15	0.91	All	Rural	Signal	HSM - 14.6.2.6
1.2.12.I5.1 - Pavement - Add Right Turn Lane on One Approach	Unit Qnty	15	0.77	All	Urban	Minor Stop	HSM - 14.6.2.6
1.2.12.I7.1 - Pavement - Add Right Turn Lane on One Approach	Unit Qnty	15	0.91	All	Urban	Signal	HSM - 14.6.2.6
1.2.13.AL.1 - Pavement - Left Turn Acceleration Lane	Unit Qnty	15	0.50	RE,SOD,SSD,AG,LT	All	All	Historic IDOT CMF
1.2.14.AL.1 - Pavement - Right Turn Acceleration Lane	Unit Qnty	15	0.50	RE,SSD,RT	All	All	Historic IDOT CMF
1.2.15.AL.1 - Pavement - One-Way Couple	Unit Qnty	15	0.50	All	All	All	Historic IDOT CMF
1.2.16.I1.1 - Pavement - Convert Stop-Controlled Intersection to Roundabout	Unit Qnty	15	0.18	All	Rural	Minor Stop	HSM - 14.4.2.3
1.2.16.I2.1 - Pavement - Convert All-Way Stop Controlled Intersection to Roundabout	Unit Qnty	15	1.03	All	Rural	All Stop	HSM - 14.4.2.3
1.2.16.I5.1 - Pavement - Convert Stop-Controlled Intersection to Roundabout	Unit Qnty	15	0.19	All	Urban	Minor Stop	HSM - 14.4.2.3
1.2.16.I6.1 - Pavement - Convert All-Way Stop Controlled Intersection to Roundabout	Unit Qnty	15	1.03	All	Urban	All Stop	HSM - 14.4.2.3
1.2.17.I3.1 - Pavement - Convert Signal to Roundabout	Unit Qnty	15	0.22	All	Rural	Signal	HSM - 14.4.2.2
1.2.17.I7.1 - Pavement - Convert Signal to Roundabout	Unit Qnty	15	0.22	All	Urban	Signal	HSM - 14.4.2.2
1.2.18.I1.1 - Pavement - Reduce Intersection Skew Angle (3 Leg - Two Lane Facility)	Unit Qnty	15	<sup>2</sup>	All	Rural	Minor Stop	HSM - 14.6.2.1
1.2.18.I1.2 - Pavement - Reduce Intersection Skew Angle (4 Leg - Two Lane Facility)	Unit Qnty	15	<sup>2</sup>	All	Rural	Minor Stop	HSM - 14.6.2.1
1.2.18.I1.3 - Pavement - Reduce Intersection Skew Angle (3 Leg - Multilane Facility)	Unit Qnty	15	<sup>2</sup>	All	Rural	Minor Stop	HSM - 14.6.2.1
1.2.18.I1.4 - Pavement - Reduce Intersection Skew Angle (4 Leg - Multilane Facility)	Unit Qnty	15	<sup>2</sup>	All	Rural	Minor Stop	HSM - 14.6.2.1
1.2.19.I7.1 - Pavement - Remove Unwarranted Signal on One-way Street	Unit Qnty	15	0.76	RT, AG, LT, T, SOD=0.76, RE=0.71, PD=0.82	Urban	Signal	HSM - 14.4.2.5
1.2.20.I1.1 - Pavement - Convert Minor-Road Stop Control to All-Way Stop Control	Unit Qnty	5	0.52	All	Rural	Minor Stop	HSM - 14.4.2.4
1.2.20.I5.1 - Pavement - Convert Minor-Road Stop Control to All-Way Stop Control	Unit Qnty	5	0.30	All	Urban	Minor Stop	HSM - 14.4.2.4
1.2.21.AL.1 - Pavement - Increase Width of Paved Shoulder	Miles	12	0.90	All	All	All	Historic IDOT CMF
1.2.22.AL.1 - Pavement - Increase Lane Width	Miles	12	0.90	All	All	All	Historic IDOT CMF
1.2.23.I1.1 - Pavement - Increase Intersection Median Width by 3 feet (4 Leg)	Miles	12	0.96	AG, HO, LT, PKV,RE, RT, SSD, SSO, T	Rural	Minor Stop	HSM - 14.6.2.7
1.2.23.I2.1 - Pavement - Increase Intersection Median Width by 3 feet (4 Leg)	Miles	12	0.96	AG, HO, LT, PKV,RE, RT, SSD, SSO, T	Rural	All Stop	HSM - 14.6.2.7
1.2.23.I5.1 - Pavement - Increase Intersection Median Width by 3 feet (3 Leg)	Miles	12	1.03	AG, HO, LT, PKV,RE, RT, SSD, SSO, T	Urban	Minor Stop	HSM - 14.6.2.7
1.2.23.I5.2 - Pavement - Increase Intersection Median Width by 3 feet (4 Leg)	Miles	12	1.05	AG, HO, LT, PKV,RE, RT, SSD, SSO, T	Urban	Minor Stop	HSM - 14.6.2.7



TABLE A4  
IDOT Benefit-Cost Analysis Tool Countermeasures List

COUNTERMEASURES	Unit	Service Life	CMF	Crash Type Affected by Countermeasures	Setting Type	Facility Type	Source <sup>1</sup>
1.2.23.I6.1 - Pavement - Increase Intersection Median Width by 3 feet (3 Leg)	Miles	12	1.03	AG, HO, LT, PKV,RE, RT, SSD, SSO, T	Urban	All Stop	HSM - 14.6.2.7
1.2.23.I6.2 - Pavement - Increase Intersection Median Width by 3 feet (4 Leg)	Miles	12	1.05	AG, HO, LT, PKV,RE, RT, SSD, SSO, T	Urban	All Stop	HSM - 14.6.2.7
1.2.23.I7.2 - Pavement - Increase Intersection Median Width by 3 feet (4 Leg)	Miles	12	1.03	AG, HO, LT, PKV,RE, RT, SSD, SSO, T	Urban	Signal	HSM - 14.6.2.7
<b><u>1.3 Signing</u></b>							
1.3.1.IU.1 - Signing - Upgrade Signs to conform with MUTCD	Unit Qnty	6	0.85	All	Urban	All	Clearinghouse #62
1.3.2.AL.1 - Signing - Speed Signing	Unit Qnty	6	0.60	All	All	All	Historic IDOT CMF
1.3.3.I7.1 - Signing - Install Advance Signal Warning Signs	Unit Qnty	6	0.65	AG (AG, RT, LT, T, SOD)	Urban	Signal	Clearinghouse #1684
1.4.4.I7.1 - Signing - Install Advance Signal Warning with Flashers	Unit Qnty	6	0.64, 0.38	RE= 0.64, AG (AG, RT, LT, T, SOD)= 0.38	Urban	Signal	Clearinghouse #1672, 1673
1.3.5.I3.1 - Signing - Install Advance Street Name Signs	Unit Qnty	6	0.99	All	Rural	Signal	Clearinghouse #2450
1.3.5.I7.1 - Signing - Install Advance Street Name Signs	Unit Qnty	6	0.99	All	Urban	Signal	Clearinghouse #2450
1.3.6.I9.1 - Signing - Minor Leg Stop	Unit Qnty	5	0.60	AG,LT,RT,T	All	Local Unsignalized	Historic IDOT CMF
1.3.6.I5.1 - Signing - Minor Leg Stop	Unit Qnty	5	0.60	AG,LT,RT,T	Urban	Minor Stop	Historic IDOT CMF
1.3.7.I1.1 - Signing - Yield Sign	Unit Qnty	5	0.60	AG,LT,RT,T	All	Local Unsignalized	Historic IDOT CMF
1.3.7.I5.1 - Signing - Yield Sign	Unit Qnty	5	0.60	AG,LT,RT,T	Urban	Minor Stop	Historic IDOT CMF
1.3.8.AL.1 - Signing - Changeable Message Signs	Unit Qnty	6	0.90	All	All	All	Historic IDOT CMF
1.3.9.AL.1 - Signing - Delineators	Unit Qnty	4	0.60	All	All	All	Historic IDOT CMF
1.3.10.AL.1 - Signing - Overhead Sign Truss	Unit Qnty	15	0.60	RE,SOD	All	All	Historic IDOT CMF
1.3.11.I3.1 - Signing - Permit Right-turn on Red	Unit Qnty	15	1.60	RT, AG, SSD, T	Rural	Signal	HSM - 14.7.2.6
1.3.11.I7.1 - Signing - Permit Right-turn on Red	Unit Qnty	15	1.60	RT, AG, SSD, T	Urban	Signal	HSM - 14.7.2.6
1.3.11.I3.1 - Signing - Prohibit Right-turn on Red	Unit Qnty	15	0.63	RT, AG, SSD, T	Rural	Signal	HSM - 14.7.2.6
1.3.11.I7.1 - Signing - Prohibit Right-turn on Red	Unit Qnty	15	0.63	RT, AG, SSD, T	Urban	Signal	HSM - 14.7.2.6
1.3.12.I5.1 - Signing - Prohibit Left-Turns	Unit Qnty	15	0.36	LT, AG, T, SSD	Urban	Minor Stop	HSM - 14.7.2.1
1.3.12.I5.2 - Signing - Prohibit Left-Turns and U-turns	Unit Qnty	15	0.23	LT, AG, T, SSD	Urban	Minor Stop	HSM - 14.7.2.1
1.3.12.I7.1 - Signing - Prohibit Left-Turns	Unit Qnty	15	0.36	LT, AG, T, SSD	Urban	Signal	HSM - 14.7.2.1
1.3.12.I7.2 - Signing - Prohibit Left-Turns and U-turns	Unit Qnty	15	0.23	LT, AG, T, SSD	Urban	Signal	HSM - 14.7.2.1
1.3.13.I1.1 - Signing - Replace Left-turns with Right-Turn/U-Turn Combination	Unit Qnty	15	0.64	All	Rural	Minor Stop	HSM - 14.7.2.5
1.3.13.I2.1 - Signing - Replace Left-turns with Right-Turn/U-Turn Combination	Unit Qnty	15	0.64	All	Rural	All Stop	HSM - 14.7.2.5
1.3.13.I5.1 - Signing - Replace Left-turns with Right-Turn/U-Turn Combination	Unit Qnty	15	0.64	All	Urban	Minor Stop	HSM - 14.7.2.5
1.3.13.I6.1 - Signing - Replace Left-turns with Right-Turn/U-Turn Combination	Unit Qnty	15	0.64	All	Urban	All Stop	HSM - 14.7.2.5

TABLE A4  
IDOT Benefit-Cost Analysis Tool Countermeasures List

COUNTERMEASURES	Unit	Service Life	CMF	Crash Type Affected by Countermeasures	Setting Type	Facility Type	Source <sup>1</sup>
1.3.14.I1.1 - Signing - Provide "Stop Ahead" Pavement Markings	Unit Qnty	3	0.92	All	Rural	Minor Stop	HSM - 14.7.2.2
1.3.14.I2.1 - Signing - Provide "Stop Ahead" Pavement Markings	Unit Qnty	3	0.58	All	Rural	All Stop	HSM - 14.7.2.2
<b><u>1.4 Signalization</u></b>							
1.4.1.I1.1 - Signalization - Install Traffic Signals	Unit Qnty	15	Varies	RT (RT)= 0.23. LT (AG, T, LT,SOD) = 0.4, RE=1.58	Rural	Minor Stop	HSM - 14.4.2.6
1.4.1.I2.1 - Signalization - Install Traffic Signals	Unit Qnty	15	Varies	RT (RT)= 0.23. LT (AG, T, LT,SOD) = 0.4, RE=1.58	Rural	All Stop	HSM - 14.4.2.6
1.4.1.I5.1 - Signalization - Install Traffic Signals	Unit Qnty	15	Varies	RT (RT, AG,T,LT,SOD) = 0.33, RE = 2.43	Urban	Minor Stop	HSM - 14.4.2.6
1.4.1.I6.1 - Signalization - Install Traffic Signals	Unit Qnty	15	Varies	RT (RT, AG,T,LT,SOD) = 0.33, RE = 2.43	Urban	All Stop	HSM - 14.4.2.6
1.4.2.I3.1 - Signalization - Relocation of Signal Supports	Unit Qnty	15	0.75	FO	Rural	Signal	Historic IDOT CMF
1.4.2.I7.1 - Signalization - Relocation of Signal Supports	Unit Qnty	15	0.75	FO	Urban	Signal	Historic IDOT CMF
1.4.3.I1.1 - Signalization - Flashing Beacon	Unit Qnty	10	Varies	RE =0.92, AG (AG, LT, RT, T, SOD) = 0.87	Rural	Minor Stop	HSM - 14.7.2.3
1.4.3.I2.1 - Signalization - Flashing Beacon	Unit Qnty	10	0.72	AG, LT, RT, T, SOD	Rural	All Stop	HSM - 14.7.2.3
1.4.3.I5.1 - Signalization - Flashing Beacon	Unit Qnty	10	Varies	RE =0.92, AG (AG, LT, RT, T, SOD) = 0.87	Urban	Minor Stop	HSM - 14.7.2.3
1.4.3.I6.1 - Signalization - Flashing Beacon	Unit Qnty	10	0.72	AG, LT, RT, T, SOD	Urban	All Stop	HSM - 14.7.2.3
1.4.4.I3.1 - Signalization - Add Left Turn Phase on One Approach (Permissive or Perm/Prot --> Protected)	Unit Qnty	10	0.94	All	Rural	Signal	HSM - 14.7.2.4
1.4.4.I3.2 - Signalization - Add Left Turn Phase on One Approach (Permissive --> Perm/Prot)	Unit Qnty	10	0.99	All	Rural	Signal	HSM - 14.7.2.4
1.4.4.I7.1 - Signalization - Add Left Turn Phase on One Approach (Permissive or Perm/Prot --> Protected)	Unit Qnty	10	0.94	All	Urban	Signal	HSM - 14.7.2.4
1.4.4.I7.2 - Signalization - Add Left Turn Phase on One Approach (Permissive --> Perm/Prot)	Unit Qnty	10	0.99	All	Urban	Signal	HSM - 14.7.2.4
1.4.5.I3.1 - Signalization - Modify Change and Clearance Interval (ITE Recommended Practice)	Unit Qnty	10	0.88	All	Rural	Signal	HSM - 14.7.2.7
1.4.5.I7.1 - Signalization - Modify Change and Clearance Interval (ITE Recommended Practice)	Unit Qnty	10	0.88	All	Urban	Signal	HSM - 14.7.2.7
1.4.6.I7.1 - Signalization - Increase to 12 Inch Lens	Unit Qnty	10	0.97	All	Urban	Signal	Clearinghouse #2334
1.4.7.I3.1 - Signalization - Add Traffic Actuation	Unit Qnty	10	0.75	RE,AG,LT,RT,T	Rural	Signal	Historic IDOT CMF
1.4.7.I7.1 - Signalization - Add Traffic Actuation	Unit Qnty	10	0.75	RE,AG,LT,RT,T	Urban	Signal	Historic IDOT CMF
1.4.8.I3.1 - Signalization - Time Lane Control	Unit Qnty	10	0.75	HO,SOD	Rural	Signal	Historic IDOT CMF
1.4.8.I7.1 - Signalization - Time Lane Control	Unit Qnty	10	0.75	HO,SOD	Urban	Signal	Historic IDOT CMF
1.4.9.I3.1 - Signalization - Optical Programmed	Unit Qnty	10	0.75	RE,AG,LT,RT,T	Rural	Signal	Historic IDOT CMF
1.4.9.I7.1 - Signalization - Optical Programmed	Unit Qnty	10	0.75	RE,AG,LT,RT,T	Urban	Signal	Historic IDOT CMF
1.4.10.I3.1 - Signalization - Add Pedestrian Controls	Unit Qnty	10	0.75	PD,PDC	Rural	Signal	Historic IDOT CMF

TABLE A4  
IDOT Benefit-Cost Analysis Tool Countermeasures List

COUNTERMEASURES	Unit	Service Life	CMF	Crash Type Affected by Countermeasures	Setting Type	Facility Type	Source <sup>1</sup>
1.4.10.I7.1 - Signalization - Add Pedestrian Controls	Unit Qnty	10	0.75	PD,PDC	Urban	Signal	Historic IDOT CMF
1.4.11.I3.1 - Signalization - Add Mast Arms and Signal Head per Lane	Unit Qnty	15	0.75	RE,AG,LT,RT,T	Rural	Signal	Historic IDOT CMF
1.4.11.I7.3 - Signalization - Add Mast Arms and Signal Head per Lane	Unit Qnty	15	0.75	RE,AG,LT,RT,T	Urban	Signal	Historic IDOT CMF
1.4.12.AL.1 - Signalization - Safety Lighting	Unit Qnty	15	0.62	NGT	All	All	HSM - 14.6.2.8
1.4.13.IU.1 - Signalization - Install Automated Enforcement of Red Light Violations	Unit Qnty	10	0.84, 1.24	RT, LT, AG,SOD,T - 0.84, RE - 1.24	Urban	Signal	HSM - 14.7.2.8
<b><u>2.0 Non-Intersection (Segment) Locations</u></b>							
<b><u>2.1 Pavement Treatments</u></b>							
2.1.2.S1.1 - Pavement Treatments - Modify Lane Width	Miles	12	<sup>2</sup>	ROR, FO, HO, OVT, SOD, SSD	Rural	Two-Lane	HSM - 13.4.2.1
2.1.2.S2.1 - Pavement Treatments - Modify Lane Width	Miles	12	<sup>2</sup>	ROR, FO, HO, OVT, SOD, SSD	Rural	Multi-Undivided	HSM - 13.4.2.1
2.1.2.S3.1 - Pavement Treatments - Modify Lane Width	Miles	12	<sup>2</sup>	ROR, FO, HO, OVT, SOD, SSD	Rural	Multi-Divided	HSM - 13.4.2.1
2.1.3.S1.1 - Pavement Treatments - Add or Widen Paved Shoulder	Miles	12	<sup>2</sup>	ROR, FO, HO, OVT, SOD, SSD	Rural	Two-Lane	HSM - 13.4.2.4
2.1.3.S2.1 - Pavement Treatments - Add or Widen Paved Shoulder	Miles	12	<sup>2</sup>	ROR, FO, HO, OVT, SOD, SSD	Rural	Multi-Undivided	HSM - 13.4.2.4
2.1.3.S3.1 - Pavement Treatments - Add or Widen Paved Shoulder	Miles	12	<sup>2</sup>	All	Rural	Multi-Divided	HSM - 13.4.2.4
2.1.4.S8.1 - Pavement Treatments - Remove Through Lane (Road Diet - Small Urban Area)	Miles	12	0.53	All	Urban	Multi-Undivided	FHWA-HRT-10-053
2.1.4.S8.2 - Pavement Treatments - Remove Through Lane (Road Diet - Large Urban Area)	Miles	12	0.81	All	Urban	Multi-Undivided	FHWA-HRT-10-053
2.1.5.S10.1 - Pavement Treatments - Add Lanes by Narrowing Existing Lanes	Miles	12	1.11	All	Urban	4 Lane Freeway	HSM - 13.4.2.2
2.1.5.S11.1 - Pavement Treatments - Add Lanes by Narrowing Existing Lanes	Miles	12	1.07	All	Urban	6 Lane Freeway	HSM - 13.4.2.2
2.1.6.AL.1 - Pavement Treatments - Resurfacing alone	Miles	10	1.00	No CRF identified	All	All	No Good Data Available
2.1.7.AL.1 - Pavement Treatments - De-Slick (formerly known as skidproofing)	Miles	5	0.43	WP	All	All	Clearinghouse #2266
2.1.8.S1.1 - Pavement Treatments - Install Rumble Strips (Shoulder)	Miles	8	0.78	FO, OVT	Rural	Two-Lane	Clearinghouse #2423
2.1.8.S2.1 - Pavement Treatments - Install Rumble Strips (Shoulder)	Miles	8	0.78	FO, OVT	Rural	Multi-Undivided	Clearinghouse #2423
2.1.8.S3.1 - Pavement Treatments - Install Rumble Strips (Shoulder)	Miles	8	0.78	FO, OVT	Rural	Multi-Divided	HSM 13.9.2.1
2.1.8.S4.1 - Pavement Treatments - Install Rumble Strips (Shoulder - Milled)	Miles	8	0.21	FO, OVT	Rural	4 Lane Freeway	HSM 13.9.2.1
2.1.8.S4.2 - Pavement Treatments - Install Rumble Strips (Shoulder-Rolled)	Miles	8	0.87	FO, OVT	Rural	4 Lane Freeway	HSM 13.9.2.1
2.1.8.S5.1 - Pavement Treatments - Install Rumble Strips (Shoulder - Milled)	Miles	8	0.21	FO, OVT	Rural	6+ Lane Freeway	HSM 13.9.2.1
2.1.8.S5.2 - Pavement Treatments - Install Rumble Strips (Shoulder-Rolled)	Miles	8	0.87	FO, OVT	Rural	6+ Lane Freeway	HSM 13.9.2.1
2.1.8.S10.1 - Pavement Treatments - Install Rumble Strips (Shoulder - Milled)	Miles	8	0.21	FO, OVT	Urban	4 Lane Freeway	HSM 13.9.2.1
2.1.8.S10.2 - Pavement Treatments - Install Rumble Strips (Shoulder-Rolled)	Miles	8	0.87	FO, OVT	Urban	4 Lane Freeway	HSM 13.9.2.1
2.1.8.S11.1 - Pavement Treatments - Install Rumble Strips (Shoulder - Milled)	Miles	8	0.21	FO, OVT	Urban	6 Lane Freeway	HSM 13.9.2.1

TABLE A4  
IDOT Benefit-Cost Analysis Tool Countermeasures List

COUNTERMEASURES	Unit	Service Life	CMF	Crash Type Affected by Countermeasures	Setting Type	Facility Type	Source <sup>1</sup>
2.1.8.S11.2 - Pavement Treatments - Install Rumble Strips (Shoulder-Rolled)	Miles	8	0.87	FO, OVT	Urban	6 Lane Freeway	HSM 13.9.2.1
2.1.8.S12.1 - Pavement Treatments - Install Rumble Strips (Shoulder - Milled)	Miles	8	0.21	FO, OVT	Urban	8+ Lane Freeway	HSM 13.9.2.1
2.1.8.S12.2 - Pavement Treatments - Install Rumble Strips (Shoulder-Rolled)	Miles	8	0.87	FO, OVT	Urban	8+ Lane Freeway	HSM 13.9.2.1
2.1.9.S1.1 - Pavement Treatments - Rumble Strips (Centerline)	Miles	8	0.79	HO, SOD	Rural	Two-Lane	HSM 13.9.2.2
2.1.10.S1.1 - Pavement Treatments - Change Vertical Grade by +1%	Miles	15	1.04	FO, OVT	Rural	Two-Lane	HSM - 13.6.2.3
2.1.10.S1.2 - Pavement Treatments - Change Vertical Grade by -1%	Miles	15	0.96	FO, OVT	Rural	Two-Lane	HSM - 13.6.2.3
2.1.11.S1.1 - Pavement Treatments - Modify Shoulder Type	Miles	15	<sup>2</sup>	FO, OVT, HO, SOD, SSD	Rural	Two-Lane	HSM - 13.4.2.5
2.1.12.S1.1 - Pavement Treatments - Provide TWLTL	Miles	15	<sup>2</sup>	LT, AG, T	Rural	Two-Lane	HSM - 16.5.2.1
2.1.12.S2.1 - Pavement Treatments - Provide TWLTL	Miles	15	<sup>2</sup>	LT, AG, T	Rural	Multi-Undivided	HSM - 16.5.2.1
2.1.12.S6.1 - Pavement Treatments - Provide TWLTL	Miles	15	<sup>2</sup>	LT, AG, T	Urban	Two-Lane	HSM - 16.5.2.1
2.1.12.S8.1 - Pavement Treatments - Provide TWLTL	Miles	15	<sup>2</sup>	LT, AG, T	Urban	Multi-Undivided	HSM - 16.5.2.1
2.1.13.S1.1 - Pavement Treatments - Provide Passing Lane	Miles	15	0.75	All	Rural	Two-Lane	HSM - 16.6.2.1
2.1.14.S1.1 - Pavement Treatments - Provide Short Four-Lane Section	Miles	15	0.65	All	Rural	Two-Lane	HSM - 16.6.2.1
<b><u>2.2 Median Treatments</u></b>							
2.2.1.S3.1 - Median Treatments - Install Median Barrier (General)	Miles	15	0.70	All	Rural	Multi-Divided	HSM - 13.5.2.4
2.2.1.S4.1 - Median Treatments - Install Median Barrier (General)	Miles	15	0.70	All	Rural	4 Lane Freeway	HSM - 13.5.2.4
2.2.1.S5.1 - Median Treatments - Install Median Barrier (General)	Miles	15	0.70	All	Rural	6+ Lane Freeway	HSM - 13.5.2.4
2.2.1.S9.1 - Median Treatments - Install Median Barrier (General)	Miles	15	0.70	All	Urban	Multi-Divided	HSM - 13.5.2.4
2.2.1.S10.1 - Median Treatments - Install Median Barrier (General)	Miles	15	0.70	All	Urban	4 Lane Freeway	HSM - 13.5.2.4
2.2.1.S11.1 - Median Treatments - Install Median Barrier (General)	Miles	15	0.70	All	Urban	6 Lane Freeway	HSM - 13.5.2.4
2.2.1.S12.2 - Median Treatments - Install Median Barrier (General)	Miles	15	0.70	All	Urban	8+ Lane Freeway	HSM - 13.5.2.4
2.2.2.S3.1 - Median Treatments - Install Steel Median Barrier	Miles	15	0.65	All	Rural	Multi-Divided	HSM - 13.5.2.4
2.2.2.S4.1 - Median Treatments - Install Steel Median Barrier	Miles	15	0.65	All	Rural	4 Lane Freeway	HSM - 13.5.2.4
2.2.2.S5.1 - Median Treatments - Install Steel Median Barrier	Miles	15	0.65	All	Rural	6+ Lane Freeway	HSM - 13.5.2.4
2.2.2.S9.1 - Median Treatments - Install Steel Median Barrier	Miles	15	0.65	All	Urban	Multi-Divided	HSM - 13.5.2.4
2.2.2.S10.1 - Median Treatments - Install Steel Median Barrier	Miles	15	0.65	All	Urban	4 Lane Freeway	HSM - 13.5.2.4
2.2.2.S11.1 - Median Treatments - Install Steel Median Barrier	Miles	15	0.65	All	Urban	6 Lane Freeway	HSM - 13.5.2.4
2.2.2.S12.2 - Median Treatments - Install Steel Median Barrier	Miles	15	0.65	All	Urban	8+ Lane Freeway	HSM - 13.5.2.4
2.2.3.S3.1 - Median Treatments - Install Cable Median Barrier (All Crashes)	Miles	15	0.71	All	Rural	Multi-Divided	HSM - 13.5.2.4

TABLE A4  
IDOT Benefit-Cost Analysis Tool Countermeasures List

COUNTERMEASURES	Unit	Service Life	CMF	Crash Type Affected by Countermeasures	Setting Type	Facility Type	Source <sup>1</sup>
2.2.3.S3.2 - Median Treatments - Install Cable Median Barrier (Crash Specific)	Miles	15	Varies	RE, SSD = 0.86, FO = 1.83, HO,SOD, OVT=0.09	Rural	Multi-Divided	Clearinghouse #1965, #1961, #1966
2.2.3.S4.1 - Median Treatments - Install Cable Median Barrier (All Crashes)	Miles	15	0.71	All	Rural	4 Lane Freeway	HSM - 13.5.2.4
2.2.3.S4.2 - Median Treatments - Install Cable Median Barrier (Crash Specific)	Miles	15	Varies	RE, SSD = 0.86, FO = 1.83, HO,SOD, OVT=0.09	Rural	4 Lane Freeway	Clearinghouse #1965, #1961, #1966
2.2.3.S5.1 - Median Treatments - Install Cable Median Barrier (All Crashes)	Miles	15	0.71	All	Rural	6+ Lane Freeway	HSM - 13.5.2.4
2.2.3.S5.2 - Median Treatments - Install Cable Median Barrier (Crash Specific)	Miles	15	Varies	RE, SSD = 0.86, FO = 1.83, HO,SOD, OVT=0.09	Rural	6+ Lane Freeway	Clearinghouse #1965, #1961, #1966
2.2.3.S9.1 - Median Treatments - Install Cable Median Barrier (All Crashes)	Miles	15	0.71	All	Urban	Multi-Divided	HSM - 13.5.2.4
2.2.3.S9.2 - Median Treatments - Install Cable Median Barrier (Crash Specific)	Miles	15	Varies	RE, SSD = 0.86, FO = 1.83, HO,SOD, OVT=0.09	Urban	Multi-Divided	Clearinghouse #1965, #1961, #1966
2.2.3.S10.1 - Median Treatments - Install Cable Median Barrier (All Crashes)	Miles	15	0.71	All	Urban	4 Lane Freeway	HSM - 13.5.2.4
2.2.3.S10.2 - Median Treatments - Install Cable Median Barrier (Crash Specific)	Miles	15	Varies	RE, SSD = 0.86, FO = 1.83, HO,SOD, OVT=0.09	Urban	4 Lane Freeway	Clearinghouse #1965, #1961, #1966
2.2.3.S11.1 - Median Treatments - Install Cable Median Barrier (All Crashes)	Miles	15	0.71	All	Urban	6 Lane Freeway	HSM - 13.5.2.4
2.2.3.S11.2 - Median Treatments - Install Cable Median Barrier (Crash Specific)	Miles	15	Varies	RE, SSD = 0.86, FO = 1.83, HO,SOD, OVT=0.09	Urban	6 Lane Freeway	Clearinghouse #1965, #1961, #1966
2.2.3.S12.1 - Median Treatments - Install Cable Median Barrier (All Crashes)	Miles	15	0.71	All	Urban	8+ Lane Freeway	HSM - 13.5.2.4
2.2.3.S12.2 - Median Treatments - Install Cable Median Barrier (Crash Specific)	Miles	15	Varies	RE, SSD = 0.86, FO = 1.83, HO,SOD, OVT=0.09	Urban	8+ Lane Freeway	Clearinghouse #1965, #1961, #1966
2.2.4.S6.1 - Median Treatments - Provide a Raised Median	Miles	15	0.61	All	Urban	Two-Lane	HSM - 13.4.2.6
2.2.4.S2.1 - Median Treatments - Provide a Raised Median	Miles	15	0.88	All	Rural	Multi-Undivided	HSM - 13.4.2.6
2.2.4.S8.1 - Median Treatments - Provide a Raised Median	Miles	15	0.78	All	Urban	Multi-Undivided	HSM - 13.4.2.6
2.2.5.S3.1 - Median Treatments - Change Width of Existing Median (with Full Access Control)	Miles	15	<sup>2</sup>	HO, SOD	Rural	Multi-Divided	HSM - 13.4.2.7
2.2.5.S3.2 - Median Treatments - Change Width of Existing Median (with Partial/No Access Control)	Miles	15	<sup>2</sup>	HO, SOD	Rural	Multi-Divided	HSM - 13.4.2.7
2.2.5.S9.1 - Median Treatments - Change Width of Existing Median (with Full Access Control)	Miles	15	<sup>2</sup>	HO, SOD	Urban	Multi-Divided	HSM - 13.4.2.7
2.2.5.S9.2 - Median Treatments - Change Width of Existing Median (with Partial/No Access Control)	Miles	15	<sup>2</sup>	HO, SOD	Urban	Multi-Divided	HSM - 13.4.2.7
<b><u>2.3 Pavement Marking</u></b>							
2.3.1.S1.1 - Pavement Markings - Place Standard Edgeling Markings	Miles	1	0.97	All	Rural	Two-Lane	HSM - 13.8.2.2
2.3.2.S1.1 - Pavement Markings - Raised Reflective Markers	Miles	4	<sup>2</sup>	NGT	Rural	Two-Lane	HSM - 13.8.2.7
2.3.2.S6.1 - Pavement Markings - Raised Reflective Markers	Miles	4	<sup>2</sup>	NGT	Urban	Two-Lane	HSM - 13.8.2.7
2.3.2.S2.1 - Pavement Markings - Raised Reflective Markers	Miles	4	<sup>2</sup>	NGT	Rural	Multi-Undivided	HSM - 13.8.2.7

TABLE A4  
IDOT Benefit-Cost Analysis Tool Countermeasures List

COUNTERMEASURES	Unit	Service Life	CMF	Crash Type Affected by Countermeasures	Setting Type	Facility Type	Source <sup>1</sup>
2.3.2.S8.1 - Pavement Markings - Raised Reflective Markers	Miles	4	<sup>2</sup>	NGT	Urban	Multi-Undivided	HSM - 13.8.2.7
2.3.2.S4.1 - Pavement Markings - Raised Reflective Markers	Miles	4	<sup>2</sup>	NGT	Rural	4 Lane Freeway	HSM - 13.8.2.7
2.3.2.S3.1 - Pavement Markings - Raised Reflective Markers	Miles	4	<sup>2</sup>	NGT	Rural	Multi-Divided	HSM - 13.8.2.7
2.3.2.S5.1 - Pavement Markings - Raised Reflective Markers	Miles	4	<sup>2</sup>	NGT	Rural	6+ Lane Freeway	HSM - 13.8.2.7
2.3.2.S9.1 - Pavement Markings - Raised Reflective Markers	Miles	4	<sup>2</sup>	NGT	Urban	Multi-Divided	HSM - 13.8.2.7
2.3.2.S10.1 - Pavement Markings - Raised Reflective Markers	Miles	4	<sup>2</sup>	NGT	Urban	4 Lane Freeway	HSM - 13.8.2.7
2.3.2.S11.1 - Pavement Markings - Raised Reflective Markers	Miles	4	<sup>2</sup>	NGT	Urban	6 Lane Freeway	HSM - 13.8.2.7
2.3.2.S12.1 - Pavement Markings - Raised Reflective Markers	Miles	4	<sup>2</sup>	NGT	Urban	8+ Lane Freeway	HSM - 13.8.2.7
2.3.3.S1.1 - Pavement Markings - Place Wide Edgeline Markings	Miles	1	1.05	All	Rural	Two-Lane	HSM - 13.8.2.3
2.3.4.S1.1 - Pavement Markings - Place Centerline Markings	Miles	1	0.99	All	Rural	Two-Lane	HSM - 13.8.2.4
2.3.5.S1.1 - Pavement Markings - Place Edgeline and Centerline Markings	Miles	1	0.76	All	Rural	Two-Lane	HSM - 13.8.2.5
2.3.5.S2.1 - Pavement Markings - Place Edgeline and Centerline Markings	Miles	1	0.76	All	Rural	Multi-Undivided	HSM - 13.8.2.5
2.3.6.S1.1 - Pavement Markings - Install Edgelines, Centerlines and Post Mounted Delineators	Miles	1	0.55	All	Rural	Two-Lane	HSM - 13.8.2.6
2.3.6.S2.1 - Pavement Markings - Install Edgelines, Centerlines and Post Mounted Delineators	Miles	1	0.55	All	Rural	Multi-Undivided	HSM - 13.8.2.6
2.3.6.S6.1 - Pavement Markings - Install Edgelines, Centerlines and Post Mounted Delineators	Miles	1	0.55	All	Urban	Two-Lane	HSM - 13.8.2.6
2.3.6.S8.1 - Pavement Markings - Install Edgelines, Centerlines and Post Mounted Delineators	Miles	1	0.55	All	Urban	Multi-Undivided	HSM - 13.8.2.6
<b><u>2.4 Railroad Crossing</u></b>							
2.4.1.AL.1 - Railroad Crossings - Automatic Railroad Gates (Crossings w/o Lights and Sounds)	Miles	15	0.33	TR, FO, RE, OVT	All	All	HSM - 16.3.2.2
2.4.1.AL.2 - Railroad Crossings - Automatic Railroad Gates (Crossings w/ Lights and Sounds)	Miles	15	0.55	TR, FO, RE, OVT	All	All	HSM - 16.3.2.2
2.4.2.AL.1 - Railroad Crossings - Install Signs and Crossbucks	Miles	15	0.75	TR, FO, RE, OVT	All	All	Clearinghouse #481
2.4.3.AL.1 - Railroad Crossings - Flashing Lights	Unit Qnty	15	0.40	TR,FO,RE,OVT	All	All	Historic IDOT CMF
2.4.4.AL.1 - Railroad Crossings - Flashing Beacons	Unit Qnty	15	0.40	TR,FO,RE,OVT	All	All	Historic IDOT CMF
2.4.5.AL.1 - Railroad Crossings - Warning Bells	Unit Qnty	15	0.50	TR	All	All	Historic IDOT CMF
2.4.6.AL.1 - Railroad Crossings - Install Flashing Lights and Sound Signals	Unit Qnty	15	0.50	TR, FO, RE, OVT	All	All	HSM - 16.3.2.1
2.4.7.AL.1 - Railroad Crossings - Pavement Markings	Miles	2	0.70	TR,RE,FO,OVT	All	All	Historic IDOT CMF
2.4.8.AL.1 - Railroad Crossings - Warning Signs - Standard	Unit Qnty	2	0.60	TR,FO,RE,OVT	All	All	Historic IDOT CMF
2.4.9.AL.1 - Railroad Crossings - Warning Signs - Special	Unit Qnty	5	0.60	TR,FO,RE,OVT	All	All	Historic IDOT CMF
2.4.10.AL.1 - Railroad Crossings - Delineators	Miles	4	0.60	TR,FO,OVT	All	All	Historic IDOT CMF
2.4.11.AL.1 - Railroad Crossings - Safety Lighting	Unit Qnty	15	0.50	TR,FO,RE,OVT	All	All	Historic IDOT CMF

TABLE A4  
IDOT Benefit-Cost Analysis Tool Countermeasures List

COUNTERMEASURES	Unit	Service Life	CMF	Crash Type Affected by Countermeasures	Setting Type	Facility Type	Source <sup>1</sup>
2.4.12.AL.1 - Railroad Crossings - Resurfacing	Miles	10	0.75	TR,FO,RE,OVT	All	All	Historic IDOT CMF
2.4.13.AL.1 - Railroad Crossings - Grade Separation	Unit Qnty	20	0.00	All	All	All	Historic IDOT CMF
<u>2.5 Bridge</u>							
2.5.1.AL.1 - Bridge - General Repair	Miles	10	0.85	PKV, HO,SOD,SSD,FO,OVT	All	All	Historic IDOT CMF
2.5.2.AL.1 - Bridge - Resurface	Miles	15	0.85	FO,HO,SOD,SSD,OVT	All	All	Historic IDOT CMF
2.5.3.AL.1 - Bridge - De-Slick	Miles	5	0.43	WP	All	All	Clearinghouse #2266
2.5.4.AL.1 - Bridge - Grooving	Miles	7	0.50	WP	All	All	Clearinghouse #2468
2.5.5.AL.1 - Bridge - Frost/Ice Detectors - Sign	Unit Qnty	10	0.75	FO,HO,SOD,SSD,OVT	All	All	Historic IDOT CMF
2.5.6.AL.1 - Bridge - Frost/Ice Detectors - Radio	Unit Qnty	10	0.75	PKV, HO,SOD,SSD,FO,OVT	All	All	Historic IDOT CMF
2.5.7.AL.1 - Bridge - Guardrail	Miles	10	0.85	FO,OVT	All	All	Historic IDOT CMF
2.5.8.AL.1 - Bridge - Separation between Pedestrians/Traffic	Miles	15	0.10	PD,PDC	All	All	Clearinghouse #1803
2.5.9.AL.1 - Bridge - Safety Lighting	Unit Qnty	15	0.50	NGT	All	All	Historic IDOT CMF
2.5.10.S1.1 - Bridge - Delineators	Miles	4	1.04	All	Rural	Two-Lane	HSM - 13.8.2.1
2.5.11.AL.1 - Bridge - Impact Attenuators	Unit Qnty	3	0.31	FO	All	All	HSM - 13.5.2.5
2.5.12.AL.1 - Bridge - Reconstruction	Miles	20	0.50	FO,HO,SOD,SSD,OVT	All	All	Historic IDOT CMF
<u>2.6 Curves</u>							
2.6.1.S1.1 - Curves - Improve Superelevation on Curve	Miles	15	<sup>2</sup>	All	Rural	Two-Lane	HSM - 13.6.2.2
2.6.2.AL.1 - Curves - Daylighting	Miles	15	0.70	OVT,FO,HO,SSD,SOD	All	All	Historic IDOT CMF
2.6.3.AL.1 - Curves - De-Slick (formerly known as skidproofing)	Miles	5	0.43	WP	All	All	Clearinghouse #2266
2.6.4.AL.1 - Curves - Guardrail	Miles	10	0.53	FO,OVT	All	All	Clearinghouse #38
2.6.5.AL.1 - Curves - Install Advanced Curve Speed/Warning Sign	Unit Qnty	5	0.87	All	All	All	HSM - 13.7.2.1
2.6.6.S1.1 - Curves - Install Post Mounted Delineators	Unit Qnty	4	1.04	All	Rural	Two-Lane	HSM - 13.8.2.1
2.6.7.S1.1 - Curves - Install Chevron Signs on Horizontal Curves	Unit Qnty	4	0.84	All	Rural	Two-Lane	Clearing House #2438
2.6.8.S1.1 - Curves - Place Edgeline and Directional Pavement Markings on Horizontal Curves	Miles	2	0.81	FO, OVT	Rural	Two-Lane	Clearing House #91
2.6.9.S1.1 - Curves - Modify Horizontal Curve Radius and Length w/ Spiral Transitions	Miles	15	<sup>2</sup>	All	Rural	Two-Lane	HSM - 13.6.2.1
2.6.9.S1.2 - Curves - Modify Horizontal Curve Radius and Length w/o Spiral Transitions	Miles	15	<sup>2</sup>	All	Rural	Two-Lane	HSM - 13.6.2.1
2.6.10.S8.1 - Curves - Increase Horizontal Curvature by One Degree	Miles	15	1.06	FO, OVT	Urban	Multi-Undivided	Clearinghouse #59
2.6.10.S8.2 - Curves - Decrease Horizontal Curvature by One Degree	Miles	15	0.94	FO, OVT	Urban	Multi-Undivided	Clearinghouse #59
<u>2.7 Roadside Safety</u>							

TABLE A4  
IDOT Benefit-Cost Analysis Tool Countermeasures List

COUNTERMEASURES	Unit	Service Life	CMF	Crash Type Affected by Countermeasures	Setting Type	Facility Type	Source <sup>1</sup>
2.7.1.AL.1 - Roadside Safety - General/Fixed Obstacle Removal	Unit Qnty	20	0.62	All	All	All	Clearinghouse #1044
2.7.2.AL.1 - Roadside Safety - Guardrail	Miles	10	0.53	FO,OVT	All	All	Clearinghouse #38
2.7.3.S1.1 - Roadside Safety - Flatten Sideslopes	Miles	15	<sup>2</sup>	All	Rural	Two-Lane	HSM - 13.5.2.1
2.7.3.S2.1 - Roadside Safety - Flatten Sideslopes	Miles	15	<sup>2</sup>	All	Rural	Multi-Undivided	HSM - 13.5.2.1
2.7.3.S3.1 - Roadside Safety - Flatten Sideslopes	Miles	15	<sup>2</sup>	All	Rural	Multi-Divided	HSM - 13.5.2.1
2.7.3.S4.1 - Roadside Safety - Flatten Sideslopes	Miles	15	<sup>2</sup>	All	Rural	4 Lane Freeway	HSM - 13.5.2.1
2.7.3.S5.1 - Roadside Safety - Flatten Sideslopes	Miles	15	<sup>2</sup>	All	Rural	6+ Lane Freeway	HSM - 13.5.2.1
2.7.3.S6.1 - Roadside Safety - Flatten Sideslopes	Miles	15	<sup>2</sup>	All	Urban	Two-Lane	HSM - 13.5.2.1
2.7.3.S8.1 - Roadside Safety - Flatten Sideslopes	Miles	15	<sup>2</sup>	All	Urban	Multi-Undivided	HSM - 13.5.2.1
2.7.3.S9.1 - Roadside Safety - Flatten Sideslopes	Miles	15	<sup>2</sup>	All	Urban	Multi-Divided	HSM - 13.5.2.1
2.7.3.S10.1 - Roadside Safety - Flatten Sideslopes	Miles	15	<sup>2</sup>	All	Urban	4 Lane Freeway	HSM - 13.5.2.1
2.7.3.S11.1 - Roadside Safety - Flatten Sideslopes	Miles	15	<sup>2</sup>	All	Urban	6 Lane Freeway	HSM - 13.5.2.1
2.7.3.S12.1 - Roadside Safety - Flatten Sideslopes	Miles	15	<sup>2</sup>	All	Urban	8+ Lane Freeway	HSM - 13.5.2.1
2.7.4.SR.1 - Roadside Safety - Increase Distance to Roadside Features	Miles	15	<sup>2</sup>	All	Rural	All	HSM - 13.5.2.2
2.7.5.AL.1 - Roadside Safety - Change Road Barrier Along Embankment to Less Rigid Type	Miles	15	0.68	FO, OVT	All	All	HSM - 13.5.2.3
2.7.6.AL.1 - Roadside Safety - Impact Attenuators	Unit Qnty	3	0.31	FO	All	All	HSM - 13.5.2.5
2.7.7.S1.1 - Roadside Safety - Reduce Roadside Hazard Rating	Miles	15	<sup>2</sup>	All	Rural	Two-Lane	HSM - 13.5.2.6
2.7.8.S6.1 - Roadside Safety - Prohibit On-Street Parking	Miles	15	0.78	All	Urban	Two-Lane	HSM - 13.11.2.1
2.7.8.S7.1 - Roadside Safety - Prohibit On-Street Parking	Miles	15	0.78	All	Urban	One-way	HSM - 13.11.2.1
2.7.9.S6.1 - Roadside Safety - Convert Free to Regulated On-Street Parking	Miles	15	0.94	All	Urban	Two-Lane	HSM - 13.11.2.2
2.7.9.S7.1 - Roadside Safety - Convert Free to Regulated On-Street Parking	Miles	15	0.94	All	Urban	One-way	HSM - 13.11.2.2
2.7.10.S6.1 - Roadside Safety - Implement Time-Limited On-Street Parking Restrictions	Miles	15	0.89	All	Urban	Two-Lane	HSM - 13.11.2.3
2.7.10.S7.1 - Roadside Safety - Implement Time-Limited On-Street Parking Restrictions	Miles	15	0.89	All	Urban	One-way	HSM - 13.11.2.3
2.7.11.S6.1 - Roadside Safety - Convert Angle Parking to Parallel Parking (Residential)	Miles	15	<sup>2</sup>	All	Urban	Two-Lane	HSM - 13.11.2.4
2.7.11.S7.1 - Roadside Safety - Convert Angle Parking to Parallel Parking (Residential)	Miles	15	<sup>2</sup>	All	Urban	One-way	HSM - 13.11.2.4
2.7.11.S8.1 - Roadside Safety - Convert Angle Parking to Parallel Parking (Residential)	Miles	15	<sup>2</sup>	All	Urban	Multi-Undivided	HSM - 13.11.2.4
2.7.11.S9.1 - Roadside Safety - Convert Angle Parking to Parallel Parking (Residential)	Miles	15	<sup>2</sup>	All	Urban	Multi-Divided	HSM - 13.11.2.4
2.7.11.S6.1 - Roadside Safety - Convert Angle Parking to Parallel Parking (Commercial/Industrial)	Miles	15	<sup>2</sup>	All	Urban	Two-Lane	HSM - 13.11.2.4
2.7.11.S7.1 - Roadside Safety - Convert Angle Parking to Parallel Parking (Commercial/Industrial)	Miles	15	<sup>2</sup>	All	Urban	One-way	HSM - 13.11.2.4



TABLE A4  
IDOT Benefit-Cost Analysis Tool Countermeasures List

COUNTERMEASURES	Unit	Service Life	CMF	Crash Type Affected by Countermeasures	Setting Type	Facility Type	Source <sup>1</sup>
2.7.11.S8.1 - Roadside Safety - Convert Angle Parking to Parallel Parking (Commercial/Industrial)	Miles	15	<sup>2</sup>	All	Urban	Multi-Undivided	HSM - 13.11.2.4
2.7.11.S9.1 - Roadside Safety - Convert Angle Parking to Parallel Parking (Commercial/Industrial)	Miles	15	<sup>2</sup>	All	Urban	Multi-Divided	HSM - 13.11.2.4
2.7.12.AL.1 - Roadside Safety - Provide Lighting	Miles	15	0.72	NGT	All	All	HSM - 13.13.2.1
2.7.13.AL.1 - Roadside Safety - Glare Shields	Miles	10	0.85	SSD,AG,FO,OVT	All	All	Historic IDOT CMF
2.7.14.AL.1 - Roadside Safety - Install Snow Fencing	Miles	10	0.92	All	All	All	Clearinghouse #190
<b><u>2.8 Other</u></b>							
2.8.1.AL.1 - Other - Turnouts (Mailbox or other)	Miles	15	0.50	Entering or exiting vehicles from shoulder area	All	All	Historic IDOT CMF
2.8.2.S10.1 - Other - Install Changeable Crash Ahead Warning Signs	Unit Qnty	15	0.56	All	Urban	4 Lane Freeway	HSM - 13.7.2.2
2.8.2.S11.1 - Other - Install Changeable Crash Ahead Warning Signs	Unit Qnty	15	0.56	All	Urban	6 Lane Freeway	HSM - 13.7.2.2
2.8.2.S12.1 - Other - Install Changeable Crash Ahead Warning Signs	Unit Qnty	15	0.56	All	Urban	8+ Lane Freeway	HSM - 13.7.2.2
2.8.2.S10.1 - Other - Install Changeable "Queue Ahead" Warning Signs	Unit Qnty	15	0.84	RE	Urban	4 Lane Freeway	HSM - 13.7.2.3
2.8.2.S11.1 - Other - Install Changeable "Queue Ahead" Warning Signs	Unit Qnty	15	0.84	RE	Urban	6 Lane Freeway	HSM - 13.7.2.3
2.8.2.S12.1 - Other - Install Changeable "Queue Ahead" Warning Signs	Unit Qnty	15	0.84	RE	Urban	8+ Lane Freeway	HSM - 13.7.2.3
2.8.3.xx.1 - Other - Install Speed Humps	Unit Qnty	10	0.60	All	Urban	Local Segment	HSM - 13.10.2.1
2.8.3.S1.1 - Other - Modify Access Point Density	Miles	15	<sup>2</sup>	All	Rural	Two-Lane	HSM - 13.14.2.1
2.8.3.S6.1 - Other - Modify Access Point Density	Miles	15	<sup>2</sup>	All	Urban	Two-Lane	HSM - 13.14.2.1
2.8.3.S7.1 - Other - Modify Access Point Density	Miles	15	<sup>2</sup>	All	Urban	One-Way	HSM - 13.14.2.1
2.8.3.S8.1 - Other - Modify Access Point Density	Miles	15	<sup>2</sup>	All	Urban	Multi-Undivided	HSM - 13.14.2.1
2.8.4.AL.1 - Other - Implement Faster Response Times for Winter Maintenance	Unit Qnty	15	0.89	All	All	All	HSM - 13.15.2.1
2.8.5.AL.1 - Other - Install Automated Speed Enforcement	Unit Qnty	15	0.83	All	All	All	HSM - 17.5.2.1
2.8.6.AL.1 - Other - Install Changeable Speed Warning Signs	Unit Qnty	15	0.54	All	All	All	HSM - 13.7.2.1
2.8.7.S14.1 - Other - Implement Area-wide Traffic Calming	Unit Qnty	15	0.89	All	Urban	Local Segment	Clearingshouse #586
2.8.8.S4.1 - Other - Modify Work Zone Duration	Unit Qnty	1	<sup>2</sup>	All	Rural	4 Lane Freeway	HSM - 16.4.2.1
2.8.8.S5.1 - Other - Modify Work Zone Duration	Unit Qnty	1	<sup>2</sup>	All	Rural	6+ Lane Freeway	HSM - 16.4.2.1
2.8.8.S10.1 - Other - Modify Work Zone Duration	Unit Qnty	1	<sup>2</sup>	All	Urban	4 Lane Freeway	HSM - 16.4.2.1
2.8.8.S11.1 - Other - Modify Work Zone Duration	Unit Qnty	1	<sup>2</sup>	All	Urban	6 Lane Freeway	HSM - 16.4.2.1
2.8.8.S12.1 - Other - Modify Work Zone Duration	Unit Qnty	1	<sup>2</sup>	All	Urban	8+ Lane Freeway	HSM - 16.4.2.1
2.8.9.S4.1 - Other - Modify Work Zone Length	Unit Qnty	1	<sup>2</sup>	All	Rural	4 Lane Freeway	HSM - 16.4.2.1
2.8.9.S5.1 - Other - Modify Work Zone Length	Unit Qnty	1	<sup>2</sup>	All	Rural	6+ Lane Freeway	HSM - 16.4.2.1

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IDOT Benefit-Cost Analysis Tool Countermeasures List

COUNTERMEASURES	Unit	Service Life	CMF	Crash Type Affected by Countermeasures	Setting Type	Facility Type	Source <sup>1</sup>
2.8.9.S10.1 - Other - Modify Work Zone Length	Unit Qnty	1	<sup>2</sup>	All	Urban	4 Lane Freeway	HSM - 16.4.2.1
2.8.9.S11.1 - Other - Modify Work Zone Length	Unit Qnty	1	<sup>2</sup>	All	Urban	6 Lane Freeway	HSM - 16.4.2.1
2.8.9.S12.1 - Other - Modify Work Zone Length	Unit Qnty	1	<sup>2</sup>	All	Urban	8+ Lane Freeway	HSM - 16.4.2.1

Notes:  
HSM = Highway Safety Manual 1<sup>st</sup> Edition  
<sup>1</sup>Clearinghouse #xxxx refers to the unique CMF ID referenced on the FHWA Clearinghouse Website, <http://www.cmfclearinghouse.org/>  
<sup>2</sup>CMF value is represented by a function or a table and is dependent on additional data.